Republic of Yemen

United Nations Office for Project Services

Yemen Emergency Electricity Access Project - Phase 2 (P178347)

Environmental and Social Management Plan

Supply and Installation of Solar Power Systems to 89 Facilities
41 Schools and 48 Healthcare Facilities

22 March 2023

Table of Contents

Abbreviations

BoQs	Bill of Quantities
C-ESMP	Contractor Environmental and Social Management Plan
EHS	Environmental, Health and Safety
E&S	Environmental and Social
ESF	Environmental and Social Framework
ESHS	Environment, Social, Health, and Safety
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Standard
ESSO	Environmental and Social Safeguards Officer
GBV	Gender Based Violence
GM	Grievance Mechanism
HSSE	Health, Safety, Social and Environment
km	Kilometer
kW	Kilowatt
kWh	kilowatt hour
LMP	Labor Management Procedures
OHS	Occupational Health and Safety
PPE	Personal Protective Equipment
PV	photovoltaic
SEA	Sexual Exploitation and Abuse
SH	Sexual Harassment
SEP	Stakeholder Engagement Plan
SMP	Security Management Plan
TPM	Third Party Monitoring
UNOPS	United Nations Office for Project Services
YEEAP	Yemen Emergency Electrical Access Project

1. Introduction

Yemen Emergency Electrical Access Project Phase 2 (YEEAP 2; P178347), hereinafter the Project, is a World Bank financed project implemented in the Republic of Yemen by the United Nations Office for Project Services (UNOPS). YEEAP 2 is a follow-up to the Yemen Emergency Electricity Access Project (P163777). YEEAP 2 has been approved by the WB in June 2022 and declared effective on 6 of October 2022 with Project Development Objective to improve access to electricity in rural and peri-urban areas within Yemen and plan for the restoration of the Yemen power sector.

Under subcomponent 1.2 of the Project, UNOPS will engage solar suppliers and installers to provide solar energy systems to critical service facilities to address the humanitarian crisis in rural and peri-urban areas across Yemen.

This subproject aims to supply and install solar power systems to 89 facilities, and it is implemented under subcomponent 1.2 of the Project. The targeted facilities under this subproject are 41 schools and 48 healthcare facilities located in the rural and peri-urban areas of the country.

Project Environmental and Social Management Framework (ESMF)[1] was prepared by the UNOPS to meet the requirements of the World Bank's Environmental and Social Framework (ESF), UNOPS requirements and the national laws and regulations. For YEEAP 2 UNOPS has also prepared the following instruments: (i) a Stakeholder Engagement Plan (SEP) , (ii), a Labor Management Procedures (LMP), (iii) a Security Management Plan (SMP), and (v) a GBV/SEA/SH Prevention and Response Action Plan.

Subproject screening was performed following the Project ESMF requirements and the screening table is available in annex 1. The current Environmental and Social Management Plan (ESMP) for this subproject has been prepared following the Project ESMF requirements, sections 5 and 6 in which the ESMP structure is based on section 6.3.1 guidance.

2. Subproject Description

2.1. Overview

Building on the success of YEEAP 1 where solar systems supplied to the facilities contribute significantly to maintaining the services across the healthcare and education center, this effort will continue under YEEAP 2 in which 89 facilities have been selected as priority facilities to be supplied with solar power system. Additional facilities will be selected and supported under the Project during its lifetime in which dedicated ESMPs will be prepared for any upcoming facilities. The facilities under this subproject are public, operational currently and were selected based on the continuous communication with the authorities as well as the partners in the country including WHO, UNICEF and MSF.

Detailed assessment of each facility under this subproject has been performed by UNOPS in coordination with the facilities management to evaluate the needs, determine the factors and requirements that should be included in the system design of each facility. Such assessment of each facility has been carried out by qualified Engineers in which the facility status, existing/expected power consumption, access, operational arrangements, system components location and such details are agreed with the facilities management. An integrity test has been performed by UNOPS during the assessment (structural integrity assessment is a process by which we determine how reliable an existing structure can carry current and future loads and fulfill the task for a given time period) for the building rooftop during selection of targeted facility and the mounting structure is designed to tolerate wind speed of up to 120

[1] YEEAP ESMF is available in the link https://documents1.worldbank.org/curated/en/099925102162242198/pdf/P1783470ESMF020220020100v40yap.pdf

km/hr.

Following the detailed assessment of facilities, solar system design and Bill of Quantity (BoQ) prepared for each facility under the subproject in which the fire and safety aspects were incorporated. Solar system design has been verified and reviewed to meet the applicable standards in which multiple review levels were introduced to ensure all safety aspects are met, as indicated in section 5.1.1.

The intervention will be entirely implemented within the existing facilities boundaries and it will be limited to supply, install, commission, and operate the solar system components and the connection to the existing electrical network of each facility.

The sites can be prepared and made ready before the photovoltaic (PV) system components installation, while the system components are imported. The following, among other things, will be included in the preparation process; installing the earthing; laying of cables and mounting structures. The mounting structures and the PV Panels will be transported manually through the internal or external stairs or by using a HIAB (in which the safety measures that will be applied for lifting operations are available within table 4, point number 2.5) where the mounting structure are in the form of pre-fabricated parts and no welding will take place in the site, the mounting structure in the facilities will be fixed on the rooftop by using anchor bolts and PV Panels will be installed on the mounting structure as well as the combiner box will be installed on the mounting structure.

Once all system components are installed, tested, commissioned and all contractor work completed in each facility, the whole system will be handed over to facilities management in which they will be fully responsible for the system operation. Training sessions will be conducted by the contractor, as part of the contract scope targeting the each facility workers to ensure their full understanding and ability to manage such operation. Furthermore, technical support will be provided to the facilities from the UNOPS team during the project lifetime.

2.2. Facilities Summary

Total facilities under this subproject are 89 facilities, 41 schools and 48 healthcare facilities, distributed across 16 governorates as detailed in table 1 below. All facilities are located in rural and peri-urban areas in which summary about the location, coordinates and system capacity are available under section 2.2.1 for healthcare facilities and section 2.2.2 for schools. Full details on the facilities layout, photos and existing condition are included in annex 7.

Table 1 Distribution of supported facilities across governorates

	Abyan	AdDhalea	Aden	AlMahwit	Al-Baydha	AlHudaydah	Al-Mahrah	Dhamar	Hajjah	Hardramout	Ibb	Lahj	Raymah	Sana'a	Shabwah	Taiz	**Total**
HC Facilities	1			2	4	4	3	5	3	5	7	1	3	2	6	2	**48**
School	3	5	6				5			8		5			7	2	**41**
Total	4	5	6	2	4	4	8	5	3	13	7	6	3	2	13	4	**89**

2.2.1. Healthcare facilities

The healthcare facilities under the subproject are 48 in which 14 Health Centers and 34 District Hospitals are included. The average number of patients per month for each facility as obtained from the facilities management and records is detailed in the below table. Accumulative average number of patients / month in all targeted facilities is 71,559 in which 31,794 are males and 39,765 are females.

Additionally, the system details and components that will be installed in each facility have been obtained from the relevant drawings and BOQ are also included in the following table. Total number of solar panels that will be installed in all facilities is approximately 1,372 with an approximate power generation capacity of 898 kW.

Table 2 Healthcare facilities summary

No	Facility Name	Coordinates	Governorate	District	Number of patients / month[2]			System Capacity kW	Number of solar panels	Panels installation location
					M	F	Total			
1.	Al Rayadah hospital	15.037327,50.478479	Hardramout	Al-Raidah and Qusayar	1516	2077	3593	25	40	Building Roof
2.	Qusayar Health Center	14.939981,50.337068	Hardramout	Al-Raidah and Qusayar	1120	1436	2556	25	40	Building Roof
3.	Sina'a Health Center	15.405247,47.764976	Hardramout	Rokhyah	504	833	1337	25	40	Building Roof
4.	Amd Health Center	15.317560,47.990719	Hardramout	Amd	351	489	840	10	16	Building Roof

[2] Average number of patients per month, facilities management records and data

No	Facility Name	Coordinates	Governorate	District	Number of patients / month[2]			System Capacity kW	Number of solar panels	Panels installation location
					M	F	Total			
5.	Al-Som Hospital	16.1422373,49.291223	Hardramout	Al-Som	800	1200	2000	25	40	Building Roof
6.	Al-Huda Health Center	14.217443,47.165805	Shabwah	Huda	141	176	317	7	12	Building Roof
7.	At-Talh Hospital - Shawah	15.154870,47.402301	Shabwah	At-Talh	212	289	501	25	40	Building Roof
8.	Al-Noqob Health Center	14.986835,45.789649	Shabwah	Al-Noqob	109	120	229	7	12	Building Roof
9.	Ar-Rawdh Hospital	14.329808,47.448963	Shabwah	Ar-Rawdha	854	1194	2048	60	96	Building Roof
10.	Al-Hanak Health Center	14.312601,46.670971	Shabwah	Al-Hanak	114	167	281	10	16	Building Roof
11.	Rodhom Hospital	14.476546, 47.273253	Shabwah	Rodhom	716	1204	1920	60	96	Building Roof
12.	Karawi Health Center	15.906818,50.971675	Al-Mahrah	Qishin	528	746	1274	15	12	Building Roof
13.	Al-Sultan Qaboos Hospital	17.801092, 52.547247	Al-Mahrah	Shahin	500	1000	1500	45	76	Building Roof
14.	Arnabut Health Center	16.455113, 50.527976	Al-Mahrah	Manaar	380	440	820	15	24	Building Roof
15.	Souq Al-Khamis Health Center	13.2395,44.38818	Lahj	Al-Qabaitah	97	107	204	5	8	Building Roof
16.	Rosod General Hospital	13.32862,44.08366	Abyan	Rosod	265	464	729	45	76	Building Roof
17.	Al-Ayn Health Center	13.54129,43.99725	Taiz	Al-Mawast	283	540	823	10	16	Building Roof
18.	Al-Shefa'a Health Unit	14.132725, 43.390203	Taiz	Al-Mawast	870	930	1800	5	8	Building Roof
19.	Al Jarahi Old Health Center	15.236850, 43.238844	Al-Hudaydah	Al-Jarahi	180	220	400	25	40	Building Roof
20.	Al Madman Health Center	15.327442, 43.168225	Al-Hudaydah	Al-Dhahi	270	280	550	5	8	Building Roof
21.	Al Hadadiah Health Center	14.684006, 43.328747	Al-Hudaydah	Al-Mansoriah	190	210	400	10	16	Building Roof
22.	Al Maibaliah Health Center	14.676056, 43.550539	Al-Hudaydah	Al-Jabin	150	200	350	7	12	Building Roof

No	Facility Name	Coordinates	Governorate	District	Number of patients / month[2]			System Capacity kW	Number of solar panels	Panels installation location
					M	F	Total			
23.	Al Ribat Health Center	14.578203, 43.639961	Raymah	Kusmah	162	188	350	5	8	Building Roof
24.	Kosmah Health Center	14.649647, 43.691425	Raymah	Mazhar	225	375	600	10	16	Building Roof
25.	Al Qusaia Health Center	13.965668, 44.008525	Raymah	Al-O'dain	4490	4510	9000	10	16	Building Roof
26.	Al-o'dain General Hospital	13.985569, 44.285447	Ibb	Ba'adan	1270	1230	2500	80	96	Building Roof
27.	Ash-Shaheed Hasan Al-Ba'adani Hospital	13.994454, 44.220831	Ibb	Reef Ibb	423	477	900	45	24	Building Roof
28.	Manzel Mussa Health Center	14.007240, 44.291559	Ibb	Ba'adan	120	130	250	15	24	Building Roof
29.	Hayssan Health Center	13.998337, 44.118586	Ibb	Reef Ibb	412	488	900	15	24	Building Roof
30.	Al-Yahari Health Center	13.917101, 44.409534	Ibb	Al-Sabrah	70	80	150	15	24	Building Roof
31.	Al-A'thareb Health Center	14.033543, 44.390008	Ibb	Al-Sha'er	200	250	450	10	16	Building Roof
32.	Al-Dhawher Health Center	13.712747, 45.302668	Ibb	Alshear	622	826	1448	7	12	Building Roof
33.	Al-Helah Health Center	14.705611,44.272816	Dhamar	Dhoran A'nis	180	300	480	5	8	Building Roof
34.	Al-Sanam Health Center	14.543358,44.264926	Dhamar	Jahran	210	240	450	10	16	Building Roof
35.	Kherbat Abu Yabis Hospital	14.307804,44.52348	Dhamar	A'nis	715	785	1500	25	40	Building Roof
36.	Zoragah Hospital	14.86317,44.383581	Dhamar	Al hada'a	815	985	1800	25	40	Building Roof
37.	At-Tashleel Health Center	14.643782,44.275976	Dhamar	Jahran	170	200	370	7	12	Building Roof
38.	Ash-Shaheed Omer Ali Hospital	13.940195,45.671206	Al-Baydha	Mukairas	716	932	1648	45	76	Building Roof
39.	A'afar-Health Center	14.261055, 45.320347	Al-Baydha	Al-Malagem	108	140	248	7	12	Building Roof

No	Facility Name	Coordinates	Governorate	District	Number of patients / month[2]			System Capacity kW	Number of solar panels	Panels installation location
					M	F	Total			
40.	Eariab-Health Center	13.928693,45.709832	Al-Baydha	Mukairas	298	391	689	7	12	Building Roof
41.	Qarn Al-Asad-Health Center	14.354766,44.820125	Al-Baydha	Al-ARSH	153	268	421	7	12	Building Roof
42.	Al-Aghmor Health Center	15.11953,43.77211	Sana'a	Manakhah	195	255	450	10	16	Building Roof
43.	Bani- Asmaial Health Center	15.164059,43.624629	Sana'a	Manakhah	186	282	468	7	12	Building Roof
44.	Qafl Shammar Hospital	15.88551,43.36582	Hajjah	Qafl Shammar	7110	8690	15800	25	40	Building Roof
45.	Al-Tour Hospital	15.59848,43.39157	Hajjah	Bani Qais	675	825	1500	20	40	Building Roof
46.	Aflah Al-Sham Health Center	16.04738,43.42371	Hajjah	Aflah Al-Sham	1717	2098	3815	10	16	Building Roof
47.	Al-Hisn Health Center	15.47982, 43.874543	Al Mahwit	Shibam	265	335	600	5	8	Building Roof
48.	Al-Nagrah Health Center	15.443497, 43.785072	Al Mahwit	Al Tawilah	137	163	300	5	8	Building Roof
	Total				**31,794**	**39,765**	**71,559**	**898**	**1,372**	

2.2.2. Schools

The total number of schools under the subproject are 41. The total number of students and workers[3] in each facility has been obtained from the facilities management are detailed in the below table. Total number of workers across all facilities is 1,678 (495 males and 1,183 females) and the total number of students in all targeted facilities is 36,578 (5,782 males and 30,796 females).

The system details and components that will be installed in each facility have been obtained from the relevant drawings and BOQ are also included in the below table. Total number of solar panels that will be installed in all facilities is approximately 700 with an approximate power generation capacity of 426 kW.

[3] The numbers stated in the table represent the total number of students and workers in the targeted schools. All premises and classes in the targeted schools will benefit from the subproject.

Table 3 Schools summary

No	Facility Name	Gender	Coordinates	Governorate	District	Number of students		Number of workers		System Capacity kW	Number of solar panels	Panels installation location
						M	F	M	F			
1.	Aisha Complex for Girls	Girls school	15.546326,49.347984	Hardramout	Ghail Bin Yamin	0	649	6	36	7	12	Building Roof
2.	Omar bin Abdulaziz School	Mixed	15.32405,48.320344	Hardramout	Daw'an	200	226	18	14	7	12	Building Roof
3.	The girls high School Ghail Bawazeer	Girls school	14.765667,49.372728	Hardramout	Al-Ghail	0	800	11	84	20	32	Building Roof
4.	The girls high School in Qasayaar	Girls school	14.942097,50.341980	Hardramout	Al-Raidah and Qusayar	0	368	0	28	10	16	Building Roof
5.	Aydeed School	Girls school	16.049705,48.975952	Hardramout	Tarim	0	403	15	18	15	24	Building Roof
6.	Al-Sayidah Khadijah School	Girls school	15.842460,48.481705	Hardramout	Al-Qatin	0	520	7	34	10	16	Building Roof
7.	Bohayrat Al-Sham School	Girls school	15.955961,48.677001	Hardramout	Shibam	0	318	23	9	7	12	Building Roof
8.	Um-Al-Mo'amineen School	Girls school	15.420230,48.056131	Hardramout	Amd	0	150	0	17	7	12	Building Roof
9.	Ayath School	Mixed	14.996590,46.854483	Shabwah	Jargan	200	260	20	0	7	12	Building Roof
10.	Al-Thawra School - Habban	Girls school	14.349974,47.078423	Shabwah	Habban	0	570	1	19	7	12	Building Roof
11.	Az-Zahrah School - Khorah	Girls school	14.432600,46.152874	Shabwah	Khorah Center	0	717	0	15	7	12	Building Roof
12.	Kerathah School	Girls school	14.999359,47.173228	Shabwah	At-Talh	0	185	10	1	7	12	Building Roof
13.	Al-Sadiyah School	Mixed	14.368332,46.910948	Shabwah	Al-Sa'eed	102	108	10	2	5	8	Building Roof
14.	Albaihani School	Girls school	14.521533,46.852196	Shabwah	Ataq	0	1046	0	28	25	40	Building Roof
15.	Belqees School	Girls school	14.538336,46.827681	Shabwah	Ataq	0	1400	0	34	25	40	Building Roof
16.	Al Mensaf School	Mixed	15.430968,51.688211	Al-Mahrah	Qishin	171	124	0	20	7	12	Building Roof
17.	Al Zahrah School	Girls school	15.209743,51.252464	Al-Mahrah	Sayhoot	0	270	0	27	7	12	Building Roof

No	Facility Name	Gender	Coordinates	Governorate	District	Number of students		Number of workers		System Capacity kW	Number of solar panels	Panels installation location
						M	F	M	F			
18.	Khawalah School	Girls school	16.229806,52.187072	Al-Mahrah	Al-Ghaydhah	0	349	3	19	10	16	Building Roof
19.	Radfan School	Mixed	16.633166,52.162804	Al-Mahrah	Haswin	231	238	21	14	15	24	Building Roof
20.	Saeed Naseeb School	Mixed	15.235521,51.11021	Al-Mahrah	Al-Masilah	290	297	22	14	10	16	Building Roof
21.	Al-Qaiti School	Mixed	13.87671,45.21305	Lahj	Labuos	180	240	2	20	7	12	Building Roof
22.	Ash-Shaheed Said Abdulmuhsen School	Mixed	13.774110, 45.220180	Lahj	Yaher	540	752	23	29	7	12	Building Roof
23.	Mojama'a Al-Saeed School	Girls school	12.99506,44.91443	Lahj	Tuban	0	3590	1	91	15	24	Building Roof
24.	Al-Khansa School	Girls school	13.885818, 45.224311	Lahj	Labuos	0	327	4	15	7	12	Building Roof
25.	Mojama'a Ash-Shaheed Al-Awdi	Mixed	13.871667, 45.25388	Lahj	Yafe'e	898	1075	33	42	15	24	Building Roof
26.	Khawlah Bint Al-Azwar School	Girls school	12.883390, 44.977996	Aden	Dar Sa'ad	0	2040	23	51	10	16	Building Roof
27.	Abu Harb School	Girls school	12.838791, 44.956400	Aden	Al-Boraiqah	0	1800	22	58	15	24	Building Roof
28.	Asma Bint Abu Baker School	Girls school	12.836111, 44.947500	Aden	Al-Boraiqah	0	1661	4	81	15	24	Building Roof
29.	Ba-Theb School	Girls school	12.861722, 44.995667	Aden	Al-Mansourah	0	1040	10	55	20	32	Building Roof
30.	Mojamma Al-Mehdhar (Ali Salem Baraba'a)	Girls school	12.873556, 44.979722	Aden	Al-Mansourah	0	1400	20	51	20	32	Building Roof
31.	Al-Mmdarah Girl School	Girls school	12.875000, 45.008611	Aden	Al-Shiekh	0	3050	14	96	15	24	Building Roof
32.	Ali Mohammed Saleh School	Girls school	13.698889, 44.731667	Ad-Dhale'e	Ad-Dhale'e	0	1330	10	54	10	16	Building Roof
33.	Abdullah Hamoud Al-Samni School	Mixed	13.717500, 44.722778	Ad-Dhale'e	Ad-Dhale'e	580	520	2	34	7	12	Building Roof
34.	Abdullah Abduldaim School	Mixed	13.793689, 44.720595	Ad-Dhale'e	Ad-Dhale'e	720	780	45	20	7	12	Building Roof

No	Facility Name	Gender	Coordinates	Governorate	District	Number of students		Number of workers		System Capacity kW	Number of solar panels	Panels installation location
						M	F	M	F			
35.	Abdullah Abdulkareem School	Mixed	13.806944, 44.708611	Ad-Dhale'e	Ad-Dhale'e	400	387	20	6	5	8	Building Roof
36.	Oqbah Bin Nafe'a School	Mixed	13.671832, 44.710780	Ad-Dhale'e	Al-Azareq	430	520	20	4	5	8	Building Roof
37.	Mudiyah Girl School	Mixed	13.12137,43.32702	Abyan	Dhubab	170	206	6	9	7	12	Building Roof
38.	Al-Faqeed Alalah School	Mixed	13.34813,44.0196	Abyan	Al-Ma'afer	250	341	17	11	5	8	Building Roof
39.	Abdullalah Shaikh School	Girls school	13.927472, 46.082583	Abyan	Mudiyah	0	234	4	16	7	12	Building Roof
40.	Omer Bin Abdulaziz School	Mixed	13.807211, 45.774212	Taiz	Lawdar	300	325	28	4	7	12	Building Roof
41.	Ash-Shaheed Abdu Qasem School	Mixed	13.826232, 46.039108	Taiz	Al-Wadhe'a	120	180	20	3	5	12	Building Roof
	Total					**5,782**	**30,796**	**495**	**1,183**	**426**	**700**	

2.3. Scope of Work

Contractor scope of work under the subproject include the following main elements, full details are available in the BoQ that is prepared for each facility. The number of contractors that will be involved in the subproject implementation is not known at this stage and it will depend on the tender evaluation results. BoQ includes the complete specification, capacity, number, cables work and related electrical work. Annex 2 provides details of the design, contractor work requirements that are considered for this subproject.

2.3.1. Electrical Works

- Solar PV Module; supply, install, test, and commission of solar panels High efficiency not less than 550 W should be either mono-crystalline or polycrystalline.
- Solar Off-Grid Inverter Supply; install, test, and commissioning of single-phase inverter.
- Charge Controller Supply; install, test, and commissioning of charge controller, efficiency not less than 92 %, rated
- Solar Battery Supply; install, test, and commissioning of Battery bank voltage shall be 48 volts with built in battery rack. Batteries shall be Gel type, the rating shall be calculated @ 10 hours discharge rate
- Ventilation system; supply, install, test and commissioning ventilation system which includes exhaust/inlet fans and Air Conditioning system.
- Earthing system; supply, install, test and commissioning earthing for all system components.

2.3.2. Fire Alarm System

- Supply and install 4 Zones Conventional Fire alarm system panel including all requirements from fire resistant cable, testing and proper labeling with complete diagrams & documentation. This includes the provision of smoke detectors, heat detectors, and alarm systems.
- Supply and install of 9 kg CO2 and Powder fire extinguishers.

2.3.3. Structural Works

- Solar panels steel structure mountain supplying, fabricating, delivering at site, hoisting and fixing in position, including all temporary staging and supporting work in accordance with the design, drawing prepared for each facility.

2.3.4. Capacity Building and Training

The training program by contractor shall be provided to the facility workers including those in charge of the system operation. Training should include but not limited to the following elements and activities:

- System safety and Operation: System description including system features, components and their functions, system software and interface; Running PV system safely; System operating procedures; System operating characteristics; System limitations; On-site system operation.
- System Maintenance: System and components and simple troubleshooting; On-site inspection and operation and maintenance; Schedule of maintenance, safety checks and procedures; Types of alarms and notifications.
- Energy Efficiency: Energy efficiency best practices and energy efficient alternatives; Customized basic energy management session for each site to all users on which appliances they can run using the solar system; Printed leaflet should be available in Arabic presenting system on/off operation, simple troubleshooting and basic maintenance.

2.3.5. System Warranty

- System maintenance and after sales services for 1 year including the provision of necessary equipment and components to run the system safely.
- Troubleshooting for the solar system for any faulty case during the maintenance period during the

maintenance visit or for any emergency request by the end users.

2.3.6. Typical System Components

Figure 1 below illustrates a simplified diagram on the typical system components that include the main elements. Detailed drawings have been prepared for each facility including all system components and installation locations.

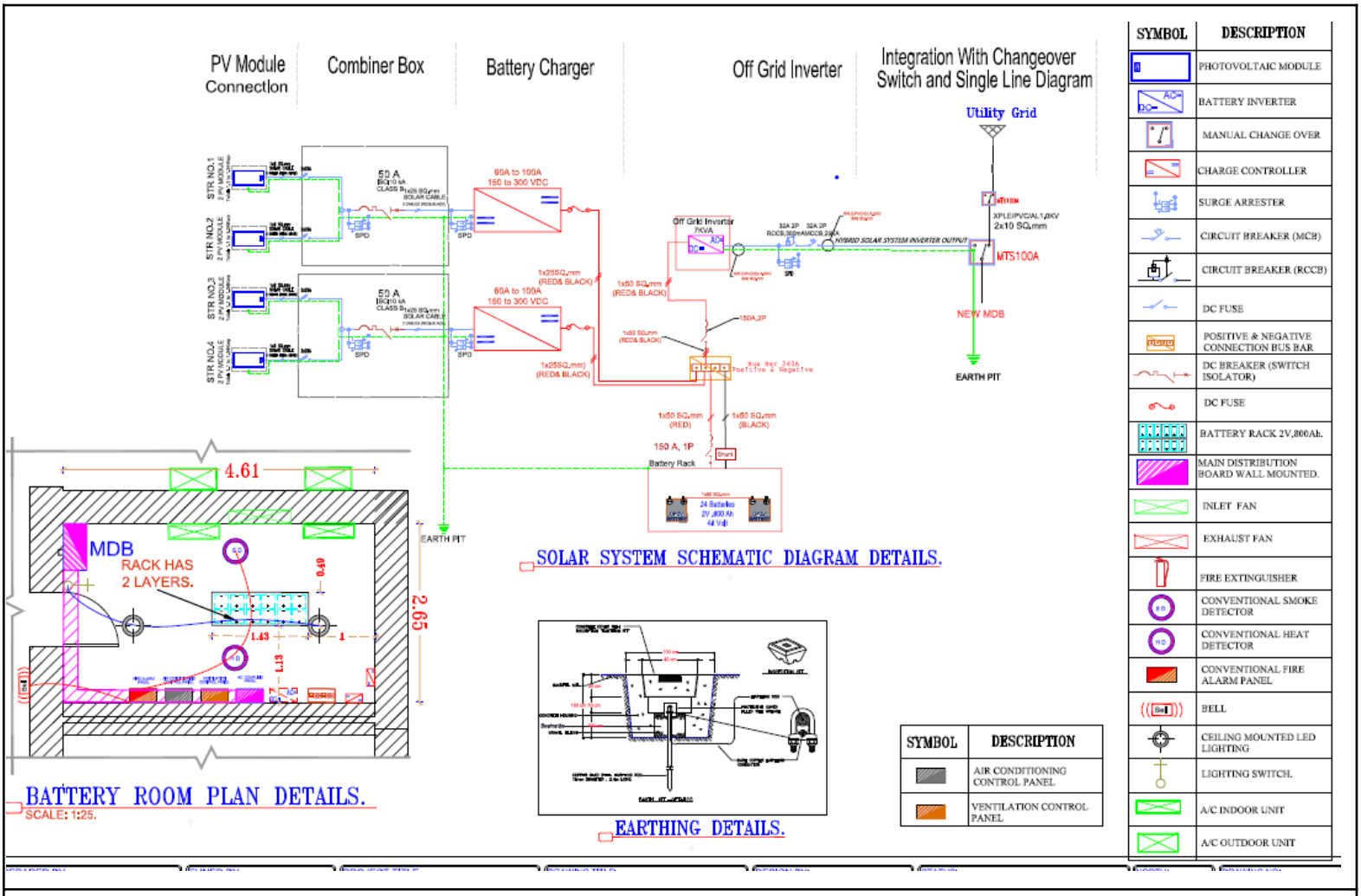


Figure 1 typical solar system components

2.3.7. Work Implementation Details

The contractor work and system installation will be entirely performed within the targeted facilities boundaries, public facilities. The solar panels will be installed at the roofs of the buildings and battery rooms locations have been identified by UNOPS engineers in coordination with the facilities management.

Estimated number of contractor workers in each facility that will be involved in system installation, testing, commissioning and start-up is 10 workers and the estimated total number of workers in all facilities under the subproject is 712 to 900 workers. The installation period and actual work within each facility under the subproject is between 7 to 10 working days. Approximately 4 workers required for system installation in each facility are unskilled and semiskilled responsible for the manual handling, installation and transportation of materials. Approximately 6 skilled workers are required in each facility responsible for the supervision, electrical work, training and maintenance activities. It is expected that

women workers will not be involved in the contractor's works at the facility level as the work is taking place mainly in rural areas.

3. Environmental and Social Baseline

In 2014, before the conflict erupted, only about 66 percent of the population in the Republic of Yemen had access to public electricity (another 12 percent had access to private electricity solutions), the lowest level in the region. Rural and peri-urban areas, which account for approximately two-thirds of Yemen's estimated 30 million population, suffered disproportionately from a lack of access to modern energy, with rural electricity access rates of only 53 percent.

The collapse of electricity and fuel supplies has also severely affected employment and household incomes in rural and peri-urban areas, due to the dependence on agriculture and energy-intensive groundwater extraction for irrigation. It has also increased dependency on scarcely available and expensive liquid fuels. Where the electricity cost in the northern governorates of Yemen is relatively high where such power supply and generation is commercial with no support from the government, the electricity cost in southern governorates remain supported by the government with affordable prices. This resulted in intermittent supply of electricity in the southern governorates with stable and continuous electrical supply in northern governorates.

On 2 October 2022, the UN-mediated truce in Yemen came to an end despite the efforts made to reach an extension agreement. The overall security condition within the country remains stable without conflict escalation post the truce end. The truce had first come into effect on 2 April 2022 and was renewed twice for two-month periods, in June and August. Among other things, it provided for a halt to offensive military operations. Overall, the 9 months of truce brought several tangible benefits to the Yemeni population, including improved access to humanitarian aid, greater economic opportunities, and a significant reduction in violence and casualties countrywide. The selected facilities under this subproject are located in safe locations away from any conflict areas.

Healthcare Sector in Yemen[4]

Availability of functioning health infrastructure, such as hospitals and primary care centers, has dwindled under the weight of conflict, with a significant share of the population having challenges with access to health care. Currently, only 50% of health facilities are fully functional, and over 80% of the population faces significant challenges in reaching food, drinking water and access to health care services. Shortages of human resources, equipment, and supplies are severely hindering healthcare provision. Furthermore, conflict has exacerbated health challenges and resulted in weak governance for the healthcare sector.

Difficulties in the provision of health service are reflected through worsening health outcomes. Reporting on the health status of Yemenis points to deteriorating health conditions amidst the ongoing conflict. These include high levels of child malnutrition, low immunization rates and outbreaks of communicable diseases. Maternal and child health are particularly affected by the worsening situation, with latest estimates pointing to one mother and six newborns dying every two hours. Additionally, conflict has also taken a direct toll on the health of the population and is now estimated to be the third main cause of death in Yemen, following ischemic heart disease and neonatal disorders.

Decreased external funding for health, coupled with unprecedented challenges such as COVID-19, raise uncertainty about the future of health services in Yemen. Yemen's health system is extremely reliant on external funding and the provision of health services is primarily done through implementing organizations, with a weak health system and an overreliance on development partners executing

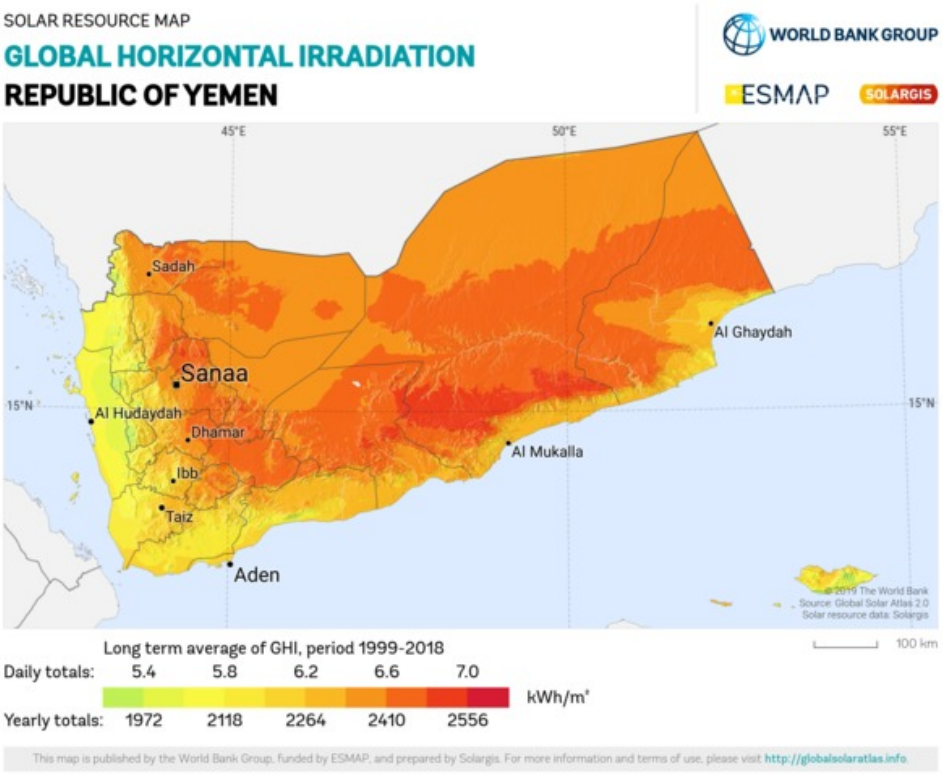
4 https://thedocs.worldbank.org/en/doc/8aca65c4db5338cd3a408c0d4a147123-0280012021/original/Yemen-Health-Policy-Note-Sep2021.pdf

vertical health programs. External financing for health has dropped drastically from previous years, leaving Yemen's health system exposed to looming threats such as COVID-19.**Solar PV in Yemen**

The crisis has resulted in boosting the PV market in Yemen where PV has penetrated the market with a high growth rate, with access to PV systems reaching around 50% of households in rural areas and 75% in urban areas, translating over one billion USD private sector driven investment in PV systems for residential sector alone over the past five years, with huge untapped potential in many other sectors. This has a positive impact on Yemeni society, not only by improving energy access during the conflict time but also by enhancing socio-economic conditions in both urban and rural areas. PV technology has reached many houses and farms, as well as some health centers and schools. This situation coupled with the dramatic reduction in PV technology prices have opened the doors for a newly emerging market with unique experiences in how the growth occurred and how the labor skills were gained and developed to serve the market needs.

PV systems have been installed for several essential public services. The health facilities and hospitals have suffered from partial or complete blackouts during the recent periods. Several large hospitals have minimized their dependence on the national grid by installing diesel generators where the fuel was supplied by the government or international organizations. Other hospitals have installed solar PV systems for lighting, especially for the emergency departments. There are cases where health facilities have installed solar PV systems for their necessary loads such as keeping vaccinations and medicines when low temperature storage is needed. The total number of schools in Yemen is around 17 thousand schools (16,961 schools in 2011 records. Scattered information has revealed some initiatives to build schools in many areas around Yemen, however data about most of them are neither available nor organized. The number of schools that use solar energy is estimated to be less than 10% of the total schools in Yemen. [5]

Figure 2 Global Horizontal Irradiation in Yemen



[5] Majority of this content extracted from Project ESMF page 25 and 26

Subproject supported facilities

Total facilities under this subproject are 89 facilities, 41 schools and 48 healthcare facilities, distributed across 16 governorates as detailed in table 1 and illustrated in figure 3. All facilities are public and located in 71 rural and peri-urban districts in which summary on the location, coordinates, estimated number of beneficiaries (as per facilities management data) and system capacity are available under section 2.2.1 for healthcare facilities and section 2.2.2 for schools. The planned support and solar system installation under this subproject shall meet the required power consumption of the targeted facilities. Additional details on the location, buildings layout, photos and existing condition as well as the proposed locations for systems installation for each facility are included in annex 7.

Total number of students within the targeted supported facilities is 36,578 (5,782 male students and 30,796 female students).

While no related GBV/SEA/SH issues came to the Project attention within the targeted facilities and minor potential risk level is expected, iIncluded below the environmental and social aspects across the subproject targeted areas categorized by governorate. The estimated population at the governorate level is indicated along with the estimated populations at the districts targeted under the subproject. The Population indicated below is 2023 estimation based on the Yemen Central Statistical Office (CSO) 2004 census, while the IDP is determined based on 2021 estimated figures.

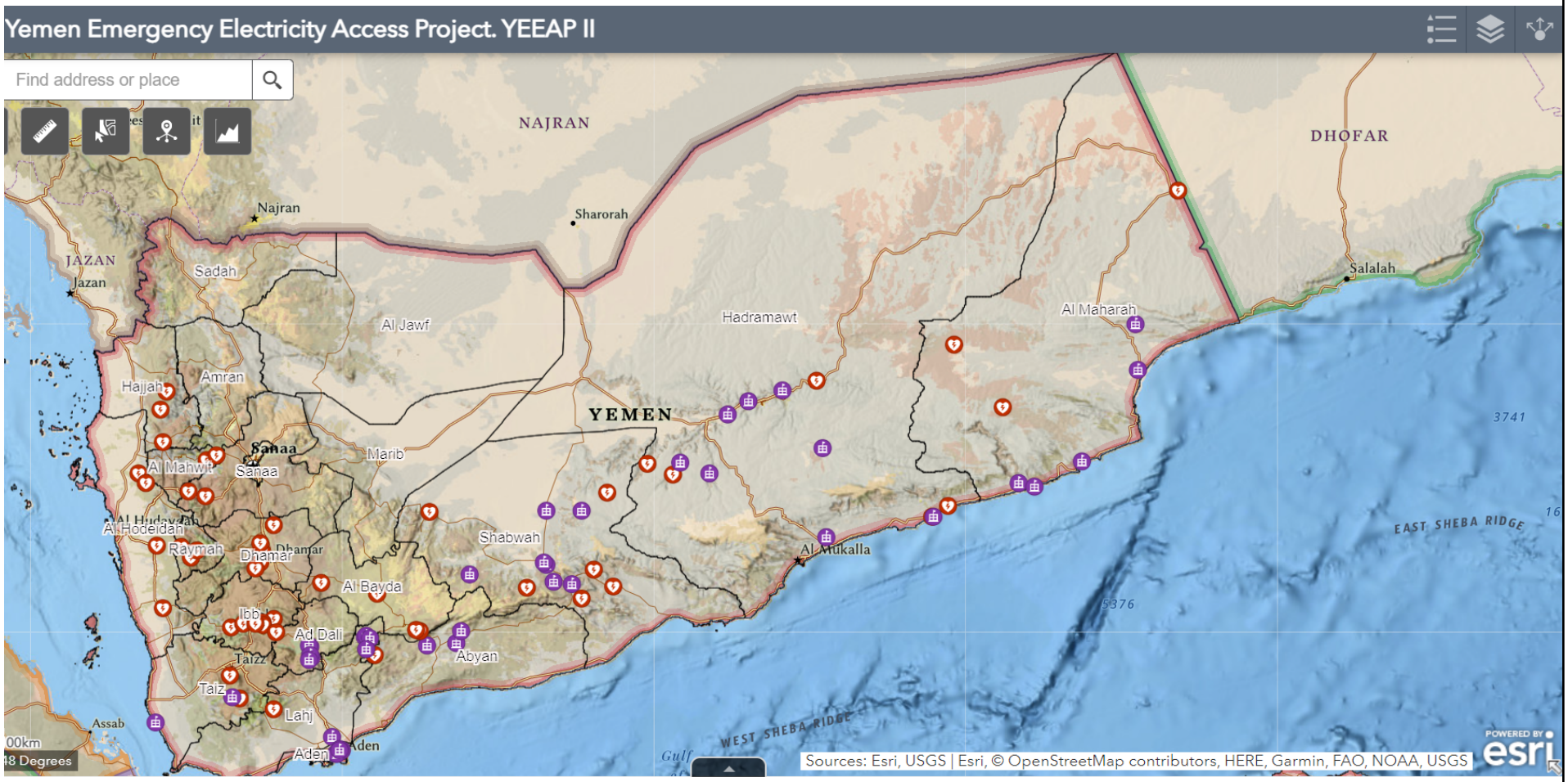


Figure 3 distribution of subproject targeted facilities across the country. Healthcare facility School

A. Abyan

Abyan Governorate is located in the southern part of the country and borders Aden. It is 427 kilometers south of Sana'a. The governorate is located on the coast of the Arabian Sea and consists of 11 districts. Zinjibar is the governorate capital. 1 health facility and 4 schools will be covered under this subproject in Abyan governorate. The supported facilities are distributed across 4 districts namely Rosod, Mudiyah, Lawdar and Al-Wadhe'a. According to the 2014 Households Budget Survey, the poverty rate in Abyan was 48.6%. With the economic downturn the governorate has faced due to the war, this rate is likely to have increased tremendously over the past few years.

Population

2023 Estimated population in the governorate and the targeted districts under the subproject is below:

	Total IDP	Estimated Population	Total Females	Total Males
Abyan governorate	62,009	664,732	326,466	338,266
Districts (Rosod, Mudiyah, Lawdar, Al-Wadhe'a)	23,237	290,337	147,242	153,135

Temperature [6]

In the targeted districts under the subproject, the summers are long, hot, oppressive, arid, and mostly cloudy and the winters are warm, muggy, dry, windy, and mostly clear. Over the course of the year, the temperature typically varies from 24°C to 36°C and is rarely below 22°C or above 37°C.

Wind

The average hourly wind speed in targeted districts experiences significant seasonal variation over the course of the year. The windier part of the year lasts for 6.6 months, from October 10 to April 29, with average wind speeds of more than 4.1 meters per second. The windiest month of the year is January, with an average hourly wind speed of 5.4 meters per second. The calmer time of year lasts for 5.4 months, from April 29 to October 10. The calmest month of the year is June, with an average hourly wind speed of 2.9 meters per second.

Solar Energy

The brighter period of the year in Abyan lasts for 2.5 months, from February 22 to May 4, with an average daily incident shortwave energy per square meter above 6.7 kWh. The brightest month of the year in Ja'ār is March, with an average of 7.1 kWh. The darker period of the year lasts for 2.8 months, from June 14 to September 6, with an average daily incident shortwave energy per square meter below 5.2 kWh. The darkest month of the year is July, with an average of 4.8 kWh.

B. AdDhalea

AdDhalea governorate is one of the governorates established after Yemeni unification in 1990. It is located between Ibb and Lahj in the south-central part of the Republic of Yemen and is 250 kilometers from the capital Sana'a. The governorate is divided into nine administrative districts, and the city of AdDhalea is the governorate capital. 5 schools will be supported under this subproject in AdDhalea governorate. The supported facilities are distributed across 2 districts namely AdDhalea and Al-Azareq. According to the 2014 Household Budget Survey, the poverty rate in AdDhalea was 59.8%. In light of economic decline, large-scale displacement, and the conflict frontline through some areas of the governorate, this rate has doubtlessly increased significantly during the past few years.

[6] Temperature, rainfall, wind and solar energy sourced from https://weatherspark.com/y/103679/Average-Weather-in-Zinjib%C4%81r-Yemen-Year-Round

Population

2023 Estimated population in the governorate and the targeted districts under the subproject is below:

	Total IDP	Estimated Population	Total Females	Total Males
AdDhalea governorate	180,548	894,975	423,957	471,018
Districts (AdDhalea and Al-Azareq)	60,885	225,722	103,390	122,332

Temperature [7]

In AdDhalea the summers are long, hot, and overcast; the winters are short, cool, and mostly clear; and it is dry year-round. Over the course of the year, the temperature typically varies from 11°C to 31°C and is rarely below 9°C or above 34°C. The hot season lasts for 3.9 months, from May 13 to September 10, with an average daily high temperature above 30°C. The hottest month of the year in Dhalie is June, with an average high of 31°C and low of 20°C.

Rainfall

The rainy period of the year lasts for 1.5 months, from July 25 to September 9, with a sliding 31-day rainfall of at least 13 millimeters. The month with the most rain in AdDhalea is August, with an average rainfall of 15 millimeters. The rainless period of the year lasts for 10 months, from September 9 to July 25. The month with the least rain is November, with an average rainfall of 3 millimeters.

Wind

The average hourly wind speed experiences mild seasonal variation over the course of the year. The windier part of the year lasts for 7.3 months, from October 4 to May 12, with average wind speeds of more than 2.8 meters per second. The windiest month of the year is March, with an average hourly wind speed of 3.3 meters per second. The calmer time of year lasts for 4.7 months, from May 12 to October 4. The calmest month of the year is August, with an average hourly wind speed of 2.4 meters per second.

Solar Energy;

The brighter period of the year in Abyan lasts for 2.5 months, from February 22 to May 4, with an average daily incident shortwave energy per square meter above 6.7 kWh. The brightest month of the year in Jaʿār is March, with an average of 7.1 kWh. The darker period of the year lasts for 2.8 months, from June 14 to September 6, with an average daily incident shortwave energy per square meter below 5.2 kWh. The darkest month of the year is July, with an average of 4.8 kWh.

C. Aden

Aden Governorate is an important economic and commercial center of the Republic of Yemen. Since 2015, it has been the temporary capital of the internationally recognized government of Yemen. It is located on the coast of the Gulf of Aden and consists of eight districts. It is home to Yemen's main commercial port, Aden Port, and regional and international free economic zones. 6 schools will be supported under this subproject in Aden, and they are distributed across 4 districts namely Dar Sa'ad, Al-Boraiqah, Al-Mansourah and Al-Shiekh Othman. According to a 2014 Households Budget Survey, the poverty rate in the Governorate of Aden was 22.2%. However, with the economic downturn the governorate has faced due to the war, this rate has increased tremendously over the past few years.

Population

2023 Estimated population in the governorate and the targeted districts under the subproject is below:

[7] Temperature, rainfall, wind and solar energy sourced from:
https://weatherspark.com/y/103127/Average-Weather-in-Dhalie-Yemen-Year-Round

	Total IDP	Estimated Population	Total Females	Total Males
Aden governorate	95,224	1,152,643	532,536	620,107
Districts (Dar Sa'ad, Al-Boraiqah, Al-Mansourah and Al-Shiekh)	74,193	720,720	327,321	393,399

Temperature [8]

The summers are long, hot, oppressive, and mostly cloudy; the winters are long, warm, muggy, windy, and mostly clear; and it is dry year-round. Over the course of the year, the temperature typically varies from 24°C to 35°C and is rarely below 23°C or above 36°C.

The hot season lasts for 4.0 months, from May 21 to September 22, with an average daily high temperature above 33°C. The hottest month of the year in Aden is June, with an average high of 35°C and low of 30°C. The cool season lasts for 3.8 months, from November 27 to March 19, with an average daily high temperature below 29°C. The coldest month of the year in Aden is January, with an average low of 24°C and high of 27°C.

Rainfall

The rainy period of the year lasts for 1.2 months, from August 10 to September 17, with a sliding 31-day rainfall of at least 13 millimeters. The month with the most rain in Aden is August, with an average rainfall of 14 millimeters. The rainless period of the year lasts for 11 months, from September 17 to August 10. The month with the least rain in Aden is December, with an average rainfall of 3 millimeters.

Wind

The average hourly wind speed in Aden experiences significant seasonal variation over the course of the year. The windier part of the year lasts for 6.5 months, from October 13 to April 28, with average wind speeds of more than 4.5 meters per second. The windiest month of the year in Aden is January, with an average hourly wind speed of 5.8 meters per second. The calmer time of year lasts for 5.5 months, from April 28 to October 13. The calmest month of the year in Aden is September, with an average hourly wind speed of 3.4 meters per second.

Solar Energy

The brighter period of the year lasts for 2.1 months, from February 24 to April 27, with an average daily incident shortwave energy per square meter above 6.7 kWh. The brightest month of the year in Aden is March, with an average of 7.1 kWh. The darker period of the year lasts for 3.8 months, from May 26 to September 19, with an average daily incident shortwave energy per square meter below 5.4 kWh. The darkest month of the year in Aden is July, with an average of 5.0 kWh.

D. AlMahwit

AlMahwit Governorate is located 113 kilometers to the northwest of the capital Sana'a, between Sana'a and Al-Hodeidah governorates. It is divided into nine administrative districts, with Mahweet City as the capital. 2 Healthcare facilities will be supported under this subproject in AlMahwit and they are located in 2 districts namely Shibam and Al Tawilah. In 2014, the poverty rate in AlMahweet was 60.7% as per the Households Budget Survey. With the economic decline the governorate has been facing due to the war, this rate is likely to have risen sharply during the past few years.

Population;

[8] Temperature, rainfall, wind and solar energy sourced from: https://weatherspark.com/y/103675/Average-Weather-in-Aden-Yemen-Year-Round

2023 Estimated population in the governorate and the targeted districts under the subproject is below:

	Total IDP	Estimated Population	Total Females	Total Males
AlMahwit governorate	40,481	820,590	402,680	417,910
Districts (Shibam and Al Tawilah)	5,913	154,676	74,950	79,726

Temperature [9]

The summers are short, warm, arid, and mostly cloudy and the winters are cold, dry, and mostly clear. Over the course of the year, the temperature typically varies from 5°C to 27°C and is rarely below 2°C or above 29°C.

The warm season lasts for 2.1 months, from May 16 to July 20, with an average daily high temperature above 25°C. The hottest month of the year is June, with an average high of 27°C and low of 14°C. The cool season lasts for 3.0 months, from November 19 to February 20, with an average daily high temperature below 21°C. The coldest month of the year is December, with an average low of 5°C and high of 20°C.

Rainfall

The sliding 31-day quantity of rainfall does not vary significantly over the course of the year, staying within 2 millimeters of 3 millimeters throughout.

Wind

The average hourly wind speed experiences mild seasonal variation over the course of the year. The windier part of the year lasts for 2.1 months, from June 18 to August 20, with average wind speeds of more than 2.8 meters per second. The windiest month of the year is July, with an average hourly wind speed of 3.2 meters per second. The calmer time of year lasts for 9.9 months, from August 20 to June 18. The calmest month of the year is May, with an average hourly wind speed of 2.4 meters per second.

Solar Energy

The brighter period of the year lasts for 1.4 months, from May 22 to July 1, with an average daily incident shortwave energy per square meter above 7.0 kWh. The brightest month of the year is June, with an average of 7.2 kWh. The darker period of the year lasts for 2.1 months, from November 19 to January 22, with an average daily incident shortwave energy per square meter below 6.1 kWh. The darkest month of the year is December, with an average of 5.8 kWh.

E. Al-Baydha

Al-Baydha is located in central Yemen and is 267 kilometers south of Sana'a. The governorate has 20 districts. The city of Al-Baydha is the governorate capital. The governorate has special significance for its location in the center of Yemen. It has shared borders with eight other Yemeni governorates: Marib, Shabwah, Lahj, Al-Dhalea, Ibb, Dhamar, and Sana'a. 4 healthcare facilities will be supported under this subproject in Al-Baydha governorate, and they are distributed across 3 districts namely Mukairas, Al-Malagem and Al-ARSH. According to the 2014 Household Budget Survey, the poverty rate in Al-Baydha was 39.2%. With the economic downturn the governorate has faced due to the war, it is likely that the current rate is far higher.

Population

2023 Estimated population in the governorate and the targeted districts under the subproject is below:

[9] Temperature, rainfall, wind and solar energy sourced from: https://weatherspark.com/y/102672/Average-Weather-in-A%C5%A3-%C5%A2aw%C4%ABlah-Yemen-Year-Round

	Total IDP	Estimated Population	Total Females	Total Males
Al-Baydha governorate	72,957	828,535	415,716	412,819
Districts (Mukairas, Al-Malagem, Al-ARSH)	7,857	159,766	81,376	78,390

Temperature [10]

The summers are warm, arid, and overcast and the winters are cool, dry, and mostly clear. Over the course of the year, the temperature typically varies from 7°C to 29°C and is rarely below 4°C or above 31°C. The warm season lasts for 3.6 months, from May 18 to September 5, with an average daily high temperature above 27°C. The hottest month of the year is June, with an average high of 29°C and low of 16°C. The cool season lasts for 3.2 months, from November 17 to February 22, with an average daily high temperature below 22°C. The coldest month of the year is January, with an average low of 7°C and high of 21°C.

Rainfall

The sliding 31-day quantity of rainfall does not vary significantly over the course of the year, staying within 3 millimeters of 4 millimeters throughout.

Wind

The average hourly wind speed experiences mild seasonal variation over the course of the year. The windier part of the year lasts for 4.6 months, from December 31 to May 18, with average wind speeds of more than 3.1 meters per second. The windiest month of the year is March, with an average hourly wind speed of 3.5 meters per second. The calmer time of year lasts for 7.4 months, from May 18 to December 31. The calmest month of the year is September, with an average hourly wind speed of 2.8 meters per second.

Solar Energy

The brighter period of the year lasts for 3.0 months, from February 23 to May 24, with an average daily incident shortwave energy per square meter above 7.0 kWh. The brightest month of the year is April, with an average of 7.3 kWh. The darker period of the year lasts for 1.5 months, from July 5 to August 21, with an average daily incident shortwave energy per square meter below 5.9 kWh. The darkest month of the year is July, with an average of 5.7 kWh.

F. AlHudaydah

AlHudaydah governorate is located in the far west of the Republic of Yemen along the Red Sea coast. It is 226 kilometers west of the capital city of Sana'a. The governorate is divided into 26 districts, and the city of AlHudaydah is the governorate's capital. Al-Hodeidah port, alongside Aden port, is one of the main commercial ports of the country. 4 healthcare facilities will be supported in the governorate and they are distributed across 4 districts namely Al-Jarahi, Al-Dhahi, Al-Mighlaf and Al-Mansoriah. According to the 2014 Households Budget Survey, 58.1% of residents of the governorate were under the poverty threshold. Since Al-Hodeidah has been a site of active fighting with hundreds of thousands displaced, this rate has dramatically increased during the past few years of the war. Current estimates suggest that the poverty rate may well have reached 80-90% in the governorate.

[10] Temperature, rainfall, wind and solar energy sourced from: https://weatherspark.com/y/103689/Average-Weather-in-Al-Bay%E1%B8%91%C4%81%E2%80%99-Yemen-Year-Round

Population

2023 Estimated population in the governorate and the targeted districts under the subproject is included below:

	Total IDP	Estimated Population	Total Females	Total Males
AlHudaydah governorate	562,957	3,244,192	1,584,780	1,659,412
Districts (Al-Jarahi, Al-Dhahi, Al-Mighlaf and Al-Mansoriah)	64,905	406,743	200,936	205,807

Temperature [11]

The summers are long, hot, and partly cloudy; the winters are warm and mostly clear; and it is oppressive and dry year-round. Over the course of the year, the temperature typically varies from 22°C to 35°C and is rarely below 20°C or above 37°C.

The hot season lasts for 4.7 months, from May 18 to October 8, with an average daily high temperature above 34°C. The hottest month of the year is July, with an average high of 35°C and low of 31°C.The cool season lasts for 3.3 months, from December 3 to March 12, with an average daily high temperature below 30°C. The coldest month of the year is January, with an average low of 22°C and high of 28°C.

Rainfall

The rainy period of the year lasts for 3.7 months, from July 1 to October 24, with a sliding 31-day rainfall of at least 13 millimeters. The month with the most rain is August, with an average rainfall of 30 millimeters. The rainless period of the year lasts for 8.3 months, from October 24 to July 1. The month with the least rain is December, with an average rainfall of 2 millimeters.

Wind

The windier part of the year lasts for 6.6 months, from October 13 to May 1, with average wind speeds of more than 3.3 meters per second. The windiest month of the year is March, with an average hourly wind speed of 3.7 meters per second. The calmer time of year lasts for 5.4 months, from May 1 to October 13. The calmest month of the year is May, with an average hourly wind speed of 3.0 meters per second.

Solar Energy

The brighter period of the year lasts for 2.0 months, from March 6 to May 5, with an average daily incident shortwave energy per square meter above 6.6 kWh. The brightest month of the year is April, with an average of 6.8 kWh. The darker period of the year lasts for 2.1 months, from November 21 to January 25, with an average daily incident shortwave energy per square meter below 5.7 kWh. The darkest month of the year is December, with an average of 5.4 kWh.

G. Al-Mahrah

Al-Mahrah governorate is located in the far southeast of Yemen on the border with the Sultanate of Oman along approximately 500 kilometers of Arabian Sea coast. It is located 1,318 kilometers east of Sana'a. The governorate is the least populous in Yemen. It is divided into nine administrative districts and Al-Ghaida, its capital, is a coastal town on the Arabian Sea. 5 schools and 3 healthcare facilities will be supported under this subproject in Al-Mahrah governorate, and they are distributed across 7 districts namely Qishin, Sayhoot, Al-Ghaidha, Haswin, Al-Masilah, Shahin and Manaar. The poverty rate in the governorate, according to the Household Budget Survey for 2014, was 57.8%.

[11] Temperature, rainfall, wind and solar energy sourced from:
https://weatherspark.com/y/102289/Average-Weather-in-Al-%E1%B8%A8udaydah-Yemen-Year-Round

Population

2023 Estimated population in the governorate and the targeted districts under the subproject is below:

	Total IDP	Estimated Population	Total Females	Total Males
Al-Mahrah governorate	16,878	200,872	86,201	114,671
Districts (Qishin, Sayhoot, Al-Ghaidha, Haswin, Al-Masilah, Shahin, Manaar)	16,595	184,069	78,962	105,106

Temperature [12]

The summers are short, sweltering, oppressive, arid, and mostly cloudy and the winters are short, warm, dry, and mostly clear. Over the course of the year, the temperature typically varies from 19°C to 37°C and is rarely below 16°C or above 39°C.

The hot season lasts for 2.8 months, from May 1 to July 27, with an average daily high temperature above 35°C. The hottest month of the year is June, with an average high of 37°C and low of 28°C. The cool season lasts for 2.5 months, from December 8 to February 24, with an average daily high temperature below 30°C. The coldest month of the year is January, with an average low of 19°C and high of 28°C.

Rainfall

The sliding 31-day quantity of rainfall does not vary significantly over the course of the year, staying within 2 millimeter of 3 millimeters throughout.

Wind

The average hourly wind speed experiences significant seasonal variation over the course of the year. The windier part of the year lasts for 2.3 months, from June 18 to August 29, with average wind speeds of more than 3.6 meters per second. The windiest month of the year is July, with an average hourly wind speed of 4.3 meters per second. The calmer time of year lasts for 9.7 months, from August 29 to June 18. The calmest month of the year is October, with an average hourly wind speed of 2.9 meters per second.

Solar Energy

The brighter period of the year lasts for 2.1 months, from March 13 to May 17, with an average daily incident shortwave energy per square meter above 7.1 kWh. The brightest month of the year is April, with an average of 7.4 kWh. The darker period of the year lasts for 2.2 months, from November 17 to January 24, with an average daily incident shortwave energy per square meter below 5.9 kWh. The darkest month of the year is December, with an average of 5.5 kWh.

H. Dhamar

Dhamar governorate is located 100 kilometers to the south of the capital Sana'a and shares borders with Sana'a and Raymah governorates in its north, Al-Hodeidah in its west, and Ibb and Al-Dhalea in its south. The governorate is divided into 12 administrative districts, with Dhamar City as the capital of the governorate. 5 healthcare facilities will be supported under this subproject in Dhamar governorate, and they are distributed across 4 districts namely Dhoran A'nis, Jahran, A'nis, and Al hada'a. According to the 2014 Household Budget Survey, the poverty rate in Dhamar was 31.1%. With the decline of economic conditions in Yemen, this number has likely increased.

[12] Temperature, rainfall, wind and solar energy sourced from:
https://weatherspark.com/y/105189/Average-Weather-in-Al-Ghayz%CC%A7ah-Yemen-Year-Round

Population

2023 Estimated population in the governorate and the targeted districts under the subproject is below:

	Total IDP	Estimated Population	Total Females	Total Males
Dhamar governorate	196,242	2,351,203	1,180,436	1,170,767
Districts (Dhoran A'nis, Jahran, A'nis, Al hada'a)	40,064	785,463	382,913	402,550

Temperature [13]

The summers are short, warm, arid, and mostly cloudy and the winters are cool, dry, and mostly clear. Over the course of the year, the temperature typically varies from 4°C to 27°C and is rarely below 1°C or above 29°C.

The warm season lasts for 1.8 months, from May 20 to July 14, with an average daily high temperature above 26°C. The hottest month of the year is June, with an average high of 27°C and low of 12°C. The cool season lasts for 3.3 months, from October 28 to February 9, with an average daily high temperature below 22°C. The coldest month of the year is December, with an average low of 4°C and high of 21°C.

Rainfall

Rain falls throughout the year in Dhamar. The month with the most rain is August, with an average rainfall of 10 millimeters. The month with the least rain is November, with an average rainfall of 2 millimeters.

Wind

The windier part of the year lasts for 5.6 months, from May 20 to November 6, with average wind speeds of more than 2.9 meters per second. The windiest month of the year is July, with an average hourly wind speed of 3.2 meters per second. The calmer time of year lasts for 6.4 months, from November 6 to May 20. The calmest month of the year is December, with an average hourly wind speed of 2.6 meters per second.

Solar Energy

The brighter period of the year lasts for 3.8 months, from February 25 to June 20, with an average daily incident shortwave energy per square meter above 7.1 kWh. The brightest month of the year is May, with an average of 7.3 kWh. The darker period of the year lasts for 1.1 months, from July 15 to August 18, with an average daily incident shortwave energy per square meter below 6.3 kWh. The darkest month of the year is December, with an average of 6.2 kWh.

I. Hajjah

Hajjah governorate is located 123 kilometers northwest of Sana'a, due north of Al-Hodeidah, between Amran to the east and the Red Sea to the west. It borders the Kingdom of Saudi Arabia and is divided into 31 administrative districts. 3 healthcare facilities will be supported under this subproject in Hajjah governorate, and they are distributed across 3 districts namely Qafl Shammar, Bani Qais, and Aflah Al-Sham. According to the 2014 Household Budget Survey, the poverty rate in Hajjah reached about 64%. More recent statistics suggest that the poverty rate is now 83%. The Interim Food Security Classification for 2019 ranks Hajjah as the governorate with the second-highest levels of poverty in Yemen.

Population

2023 Estimated population in the governorate and the targeted districts under the subproject is below:

[13] Temperature, rainfall, wind and solar energy sourced from:
https://weatherspark.com/y/103142/Average-Weather-in-Dham%C4%81r-Yemen-Year-Round

	Total IDP	Estimated Population	Total Females	Total Males
Hajjah governorate	577,960	2,480,486	1,212,872	1,267,614
Districts (Qafl Shammar, Bani Qais, and Aflah Al-Sham)	23,205	284,322	140,272	144,039

Temperature [14]

The summers are long, sweltering, humid, arid, and partly cloudy and the winters are short, warm, dry, and mostly clear. Over the course of the year, the temperature typically varies from 17°C to 39°C and is rarely below 15°C or above 40°C.

The hot season lasts for 4.7 months, from May 12 to October 3, with an average daily high temperature above 37°C. The hottest month of the year is June, with an average high of 39°C and low of 27°C. The cool season lasts for 2.9 months, from November 27 to February 25, with an average daily high temperature below 32°C. The coldest month of the year is January, with an average low of 18°C and high of 30°C.

Rainfall

The sliding 31-day quantity of rainfall does not vary significantly over the course of the year, staying within 2 millimeters of 3 millimeters throughout.

Wind

The average hourly wind speed experiences mild seasonal variation over the course of the year. The windier part of the year lasts for 2.0 months, from June 23 to August 24, with average wind speeds of more than 2.8 meters per second. The windiest month of the year is July, with an average hourly wind speed of 3.1 meters per second. The calmer time of year lasts for 10 months, from August 24 to June 23. The calmest month of the year is October, with an average hourly wind speed of 2.4 meters per second.

Solar Energy

The brighter period of the year lasts for 1.6 months, from May 26 to July 12, with an average daily incident shortwave energy per square meter above 6.9 kWh. The brightest month of the year is June, with an average of 7.1 kWh. The darker period of the year lasts for 2.2 months, from November 18 to January 25, with an average daily incident shortwave energy per square meter below 5.8 kWh. The darkest month of the year is December, with an average of 5.5 kWh.

J. Hardramout

Hadhramout governorate is located in the southeastern part of the Republic of Yemen, 794 kilometers east of the capital of Sana'a, between Al-Mahra to the east and Al-Jawf, Marib, and Shabwah to the west. The governorate is divided administratively into 28 districts, with the city of Mukalla as its capital. Hadhramout is the largest governorate of Yemen by area. It borders the Kingdom of Saudi Arabia in the north. 8 schools and 5 healthcare facilities will be supported under this subproject in Hadramout, and they are distributed across 10 districts namely Ghail Bin Yamin, Daw'an, Al-Ghail, Al-Raidah and Qusayar, Tarim, Al-Qatin, Shibam, Amd, Rokhyah and Al-Som. According to the 2014 Household Budget Survey, the poverty rate in Hadramout was 60% of the total population. This number has likely increased since. Despite the absence of open conflict in the governorate, rapid inflation has eroded purchasing power among the population.

Population

[14] Temperature, rainfall, wind and solar energy sourced from: https://weatherspark.com/y/102706/Average-Weather-in-Khayr%C4%81n-Yemen-Year-Round

2023 Estimated population in the governorate and the targeted districts under the subproject is below:

	Total IDP	Estimated Population	Total Females	Total Males
Hardramout governorate	42,555	1,684,663	782,818	901,845
Districts (Ghail Bin Yamin, Daw'an, Al-Ghail, Al-Raidah and Qusayar, Tarim, Al-Qatin, Shibam, Amd, Rokhyah and Al-Som)	9,168	716,255	337,525	378,729

Temperature [15]

In the coastal areas of Hadhramout, the summers are hot, oppressive, arid, and mostly cloudy and the winters are short, warm, humid, dry, and mostly clear. Over the course of the year, the temperature typically varies from 20°C to 34°C and is rarely below 17°C or above 37°C. The hot season lasts for 3.3 months, from April 28 to August 6, with an average daily high temperature above 33°C. The hottest month of the year is June, with an average high of 34°C and low of 28°C. The cool season lasts for 2.5 months, from December 14 to February 28, with an average daily high temperature below 29°C. The coldest month of the year is January, with an average low of 20°C and high of 28°C.

In the Wadi areas of Hadhramout, the summers are long, sweltering, arid, and partly cloudy and the winters are short, comfortable, dry, and mostly clear. Over the course of the year, the temperature typically varies from 12°C to 39°C and is rarely below 8°C or above 40°C. The hot season lasts for 5.0 months, from April 20 to September 22, with an average daily high temperature above 37°C. The hottest month of the year is July, with an average high of 38°C and low of 26°C. The cool season lasts for 2.3 months, from November 22 to January 31, with an average daily high temperature below 31°C. The coldest month of the year is January, with an average low of 13°C and high of 29°C.

Rainfall

The sliding 31-day quantity of rainfall does not vary significantly over the course of the year, staying within 1 millimeter of 2 millimeter throughout.

Wind

In the coastal areas of Hadhramout, the average hourly wind speed experiences significant seasonal variation over the course of the year. The windier part of the year lasts for 2.1 months, from June 24 to August 28, with average wind speeds of more than 3.7 meters per second. The windiest month of the year is July, with an average hourly wind speed of 4.4 meters per second. The calmer time of year lasts for 9.9 months, from August 28 to June 24. The calmest month of the year is May, with an average hourly wind speed of 2.7 meters per second.

In the Wadi areas of Hadhramout, the average hourly wind speed experiences mild seasonal variation over the course of the year. The windier part of the year lasts for 3.4 months, from February 13 to May 25, with average wind speeds of more than 3.7 meters per second. The windiest month of the year is March, with an average hourly wind speed of 4.1 meters per second. The calmer time of year lasts for 8.6 months, from May 25 to February 13. The calmest month of the year is September, with an average hourly wind speed of 3.3 meters per second.

Solar Energy

In the coastal areas of Hadhramout, the brighter period of the year lasts for 2.1 months, from March 9 to May 13, with an average daily incident shortwave energy per square meter above 7.1 kWh. The brightest

[15] Temperature, rainfall, wind and solar energy sourced from:
https://weatherspark.com/y/104568/Average-Weather-in-Su%E1%B8%A9ayl-Shib%C4%81m-Yemen-Year-Round
https://weatherspark.com/y/104783/Average-Weather-in-Ghayl-B%C4%81-Waz%C4%ABr-Yemen-Year-Round

month of the year is April, with an average of 7.4 kWh. The darker period of the year lasts for 2.2 months, from November 19 to January 25, with an average daily incident shortwave energy per square meter below 6.1 kWh. The darkest month of the year is December, with an average of 5.7 kWh.

In the Wadi areas of Hadhramout, the brighter period of the year lasts for 2.6 months, from March 18 to June 6, with an average daily incident shortwave energy per square meter above 7.4 kWh. The brightest month of the year is May, with an average of 7.7 kWh. The darker period of the year lasts for 2.3 months, from November 17 to January 26, with an average daily incident shortwave energy per square meter below 6.2 kWh. The darkest month of the year is December, with an average of 5.8 kWh.

K. Ibb

Ibb governorate is located 193 kilometers south of Sana'a, in the central part of the Republic of Yemen. The governorate is also known as the "green province" for its verdant mountains and agriculture. The governorate is divided into 20 administrative districts. The city of Ibb is the capital of the governorate. 7 healthcare facilities will be supported under this subproject in Ibb governorates, the facilities are distributed across 5 districts namely Al-O'dain, Ba'adan, Reef Ibb, Al-Sabrah, and Al-Sha'er. According to the 2014 Household Budget Survey, the poverty rate in Ibb was 56.6%. With the economic decline and military confrontations of the past years, this rate has likely increased significantly.

Population;

2023 Estimated population in the governorate and the targeted districts under the subproject is below:

	Total IDP	Estimated Population	Total Females	Total Males
Ibb governorate	228,123	3,294,418	1,716,832	1,577,586
Districts (Al-O'dain, Ba'adan, Reef Ibb, Al-Sabrah, Al-Sha'er)	20,052	553,948	295,949	257,999

Temperature [16]

The summers are short, warm, and overcast; the winters are short, cool, and mostly clear; and it is dry year-round. Over the course of the year, the temperature typically varies from 9°C to 29°C and is rarely below 6°C or above 31°C.

The warm season lasts for 2.2 months, from May 14 to July 21, with an average daily high temperature above 27°C. The hottest month of the year is June, with an average high of 29°C and low of 16°C. The cool season lasts for 2.8 months, from November 21 to February 13, with an average daily high temperature below 23°C. The coldest month of the year is January, with an average low of 9°C and high of 22°C.

Rainfall

The rainy period of the year lasts for 6.0 months, from April 4 to October 3, with a sliding 31-day rainfall of at least 13 millimeters. The month with the most rain is August, with an average rainfall of 30 millimeters. The rainless period of the year lasts for 6.0 months, from October 3 to April 4. The month with the least rain is December, with an average rainfall of 4 millimeters.

Wind

The average hourly wind speed experiences mild seasonal variation over the course of the year. The windier part of the year lasts for 1.6 months, from June 28 to August 15, with average wind speeds of

[16] Temperature, rainfall, wind and solar energy sourced from: https://weatherspark.com/y/103105/Average-Weather-in-Najd-al-Jum%C4%81%E2%80%98%C4%AB-Yemen-Year-Round

more than 2.7 meters per second. The windiest month of the year is July, with an average hourly wind speed of 3.2 meters per second. The calmer time of year lasts for 10 months, from August 15 to June 28. The calmest month of the year is September, with an average hourly wind speed of 2.2 meters per second.

Solar Energy

The brighter period of the year lasts for 3.1 months, from February 17 to May 19, with an average daily incident shortwave energy per square meter above 6.8 kWh. The brightest month of the year is March, with an average of 7.1 kWh. The darker period of the year lasts for 1.5 months, from July 9 to August 23, with an average daily incident shortwave energy per square meter below 5.7 kWh. The darkest month of the year is July, with an average of 5.6 kWh.

L. Lahj

Lahj governorate is located on the southwestern coast of the Republic of Yemen, north and west of Aden. It is 337 kilometers from the capital city of Sana'a. The governorate is divided into 15 administrative districts with the city of Al-Houta as its capital. 5 schools and 1 healthcare facility will be supported under this subproject in Lahj, facilities are distributed across 5 districts namely Al-Qabaitah, Labuos, Yaher, Tuban and Yafe'e. The poverty rate in Lahj was 69% in 2014. With the economic disruptions brought on by the war, this rate has likely increased over the past years.

Population

2023 Estimated population in the governorate and the targeted districts under the subproject is below:

	Total IDP	Estimated Population	Total Females	Total Males
Lahj governorate	79,163	1,150,474	564,161	586,313
Districts (Al-Qabaitah, Labuos, Yaher, Tuban and Yafe'e)	44,280	470,331	230,322	240,009

Temperature [17]

The summers are long, sweltering, arid, and overcast and the winters are short, comfortable, dry, and mostly clear. Over the course of the year, the temperature typically varies from 16°C to 36°C and is rarely below 14°C or above 38°C.

The hot season lasts for 4.1 months, from May 12 to September 17, with an average daily high temperature above 34°C. The hottest month of the year is June, with an average high of 36°C and low of 25°C. The cool season lasts for 2.8 months, from November 29 to February 21, with an average daily high temperature below 29°C. The coldest month of the year is January, with an average low of 16°C and high of 28°C.

Rainfall

The sliding 31-day quantity of rainfall does not vary significantly over the course of the year, staying within 3 millimeters of 6 millimeters throughout.

Wind

The average hourly wind speed experiences mild seasonal variation over the course of the year. The windier part of the year lasts for 7.3 months, from October 3 to May 13, with average wind speeds of more than 3.1 meters per second. The windiest month of the year is November, with an average hourly wind speed of 3.5 meters per second. The calmer time of year lasts for 4.7 months, from May 13 to

[17] Temperature, rainfall, wind and solar energy sourced from: https://weatherspark.com/y/103115/Average-Weather-in-%E1%B8%A8ab%C4%ABl-al-Jabr-Yemen-Year-Round

October 3. The calmest month of the year is August, with an average hourly wind speed of 2.8 meters per second.

Solar Energy

The brighter period of the year lasts for 2.9 months, from February 20 to May 15, with an average daily incident shortwave energy per square meter above 6.8 kWh. The brightest month of the year is March, with an average of 7.2 kWh. The darker period of the year lasts for 1.8 months, from July 1 to August 27, with an average daily incident shortwave energy per square meter below 5.4 kWh. The darkest month of the year is July, with an average of 5.1 kWh.

M. Raymah

Raymah governorate was established in 2004. It is located in the western part of the Republic of Yemen between Dhamar and Al-Hodeidah and is 200 kilometers from the capital Sana'a. The governorate is divided into six administrative districts and the city of Al-Jabeen is the governorate's capital. 3 healthcare facilities will be supported under this subproject in Raymah, facilities are distributed across 3 districts namely Al-Jabin, Kusmah, and Mazhar. According to the 2014 Household Budget Survey, the poverty rate in Raymah was 50%. With the economic decline caused by the war, this rate has likely increased substantially during the past few years

Population

2023 Estimated population in the governorate and the targeted districts under the subproject is below:

	Total IDP	Estimated Population	Total Females	Total Males
Raymah governorate	59,700	606,724	303,544	303,180
Districts (Al-Jabin, Kusmah, Mazhar)	27,817	339,019	170,275	168,744

Temperature [18]

The summers are short, hot, humid, and mostly cloudy; the winters are short, comfortable, and mostly clear; and it is dry year-round. Over the course of the year, the temperature typically varies from 16°C to 34°C and is rarely below 14°C or above 36°C.

The hot season lasts for 2.3 months, from May 11 to July 21, with an average daily high temperature above 32°C. The hottest month of the year is June, with an average high of 34°C and low of 24°C. The cool season lasts for 2.8 months, from November 29 to February 21, with an average daily high temperature below 28°C. The coldest month of the year is January, with an average low of 16°C and high of 27°C.

Rainfall

The rainy period of the year lasts for 7.1 months, from March 30 to November 2, with a sliding 31-day rainfall of at least 13 millimeters. The month with the most rain is August, with an average rainfall of 29 millimeters. The rainless period of the year lasts for 4.9 months, from November 2 to March 30. The month with the least rain is December, with an average rainfall of 3 millimeters.

Wind

The average hourly wind speed experiences mild seasonal variation over the course of the year. The windier part of the year lasts for 2.3 months, from June 17 to August 26, with average wind speeds of

[18] Temperature, rainfall, wind and solar energy sourced from: https://weatherspark.com/y/102662/Average-Weather-in-Al-%E1%B8%A8ad%C4%AByah-Yemen-Year-Round

more than 2.9 meters per second. The windiest month of the year is July, with an average hourly wind speed of 3.3 meters per second. The calmer time of year lasts for 9.7 months, from August 26 to June 17. The calmest month of the year is December, with an average hourly wind speed of 2.5 meters per second.

Solar Energy

The average daily incident shortwave solar energy experiences some seasonal variation over the course of the year. The brighter period of the year lasts for 2.1 months, from February 25 to April 30, with an average daily incident shortwave energy per square meter above 6.7 kWh. The brightest month of the year is March, with an average of 6.9 kWh. The darker period of the year lasts for 1.9 months, from November 22 to January 20, with an average daily incident shortwave energy per square meter below 5.9 kWh. The darkest month of the year is December, with an average of 5.7 kWh.

N. Sana'a

Sana'a governorate surrounds the capital city of Sana'a and is divided into 16 administrative districts. 2 healthcare facilities will be supported under this subproject in Sana'a governorate, both facilities are located in one district namely Manakhah. According to the 2014 Household Budget Survey, the poverty rate in Sana'a governorate was 42%. With the high inflation rate and economic disruption the governorate has faced in the past years, this rate has likely increased a great deal.

Population

2023 Estimated population in the governorate and the targeted districts under the subproject is below:

	Total IDP	Estimated Population	Total Females	Total Males
Sana'a governorate	107,522	1,522,586	745,373	777,214
Manakhah districts	5,022	110,291	56,576	53,716

Temperature [19]

The summers are short, hot, arid, and mostly cloudy and the winters are cool, dry, and mostly clear. Over the course of the year, the temperature typically varies from 10°C to 32°C and is rarely below 7°C or above 34°C.

The hot season lasts for 2.1 months, from May 18 to July 20, with an average daily high temperature above 31°C. The hottest month of the year is June, with an average high of 32°C and low of 20°C. The cool season lasts for 3.0 months, from November 17 to February 18, with an average daily high temperature below 26°C. The coldest month of the year is December, with an average low of 10°C and high of 25°C.

Rainfall

The sliding 31-day quantity of rainfall does not vary significantly over the course of the year, staying within 2 millimeters of 4 millimeters throughout.

Wind

The average hourly wind speed experiences mild seasonal variation over the course of the year. The windier part of the year lasts for 2.0 months, from June 20 to August 20, with average wind speeds of more than 2.5 meters per second. The windiest month of the year is July, with an average hourly wind

[19] Temperature, rainfall, wind and solar energy sourced from:
https://weatherspark.com/y/102676/Average-Weather-in-Maf%E1%B8%A9aq-Yemen-Year-Round

speed of 2.9 meters per second. The calmer time of year lasts for 10 months, from August 20 to June 20. The calmest month of the year is May, with an average hourly wind speed of 2.0 meters per second.

Solar Energy

The average daily incident shortwave solar energy experiences some seasonal variation over the course of the year. The brighter period of the year lasts for 1.5 months, from May 12 to June 27, with an average daily incident shortwave energy per square meter above 6.9 kWh. The brightest month of the year is June, with an average of 7.1 kWh. The darker period of the year lasts for 2.0 months, from November 21 to January 20, with an average daily incident shortwave energy per square meter below 6.1 kWh. The darkest month of the year is December, with an average of 5.9 kWh.

O. Shabwah

Shabwah governorate is located in the southeastern part of the Republic of Yemen, along the Arabian Sea coast between Abyan and Hadhramout. It is 474 kilometers southeast of the capital city of Sana'a. The governorate is divided into 17 administrative districts with the city of Ataq as its capital. 7 schools and 6 healthcare facilities will be supported under this subproject in Shabwah, facilities are distributed across 10 districts namely Al-Hanak, Al-Noqob, Al-Sa'eed, Ar-Rawdha, At-Talh, Ataq, Habban, Huda, Jardan and Rodhom. According to the2014 Household Budget Survey, the poverty rate in Shabwah was 42%. By 2018, the poverty rate in the governorate may have surpassed 80%.

Population

2023 Estimated population in the governorate and the targeted districts under the subproject is below:

	Total IDP	Estimated Population	Total Females	Total Males
Shabwah governorate	47,316	720,756	347,211	373,545
Districts (Al-Hanak, Al-Noqob, Al-Sa'eed, Ar-Rawdha, At-Talh, Ataq, Habban, Huda, Jargan, Rodhom)	24,484	317,050	151,382	165,668

Temperature [20]

The summers are long, hot, arid, and mostly cloudy and the winters are short, comfortable, dry, and mostly clear. Over the course of the year, the temperature typically varies from 13°C to 36°C and is rarely below 10°C or above 38°C.

The hot season lasts for 4.6 months, from May 8 to September 27, with an average daily high temperature above 34°C. The hottest month of the year is June, with an average high of 36°C and low of 23°C. The cool season lasts for 2.7 months, from November 28 to February 19, with an average daily high temperature below 29°C. The coldest month of the year is January, with an average low of 13°C and high of 27°C.

Rainfall

The sliding 31-day quantity of rainfall does not vary significantly over the course of the year, staying within 1 millimeter of 2 millimeters throughout.

Wind

[20] Temperature, rainfall, wind and solar energy sourced from: https://weatherspark.com/y/104319/Average-Weather-in-%E1%B8%A8abb%C4%81n-Yemen-Year-Round

The average hourly wind speed experiences mild seasonal variation over the course of the year. The windier part of the year lasts for 1.9 months, from July 4 to September 1, with average wind speeds of more than 3.3 meters per second. The windiest month of the year is August, with an average hourly wind speed of 3.8 meters per second. The calmer time of year lasts for 10 months, from September 1 to July 4. The calmest month of the year is October, with an average hourly wind speed of 2.7 meters per second.

Solar Energy

The average daily incident shortwave solar energy experiences some seasonal variation over the course of the year. The brighter period of the year lasts for 2.5 months, from March 6 to May 20, with an average daily incident shortwave energy per square meter above 7.2 kWh. The brightest month of the year is April, with an average of 7.6 kWh. The darker period of the year lasts for 2.1 months, from November 20 to January 23, with an average daily incident shortwave energy per square meter below 6.2 kWh. The darkest month of the year is December, with an average of 5.9 kWh.

P. Taiz

Taiz governorate is located in the central and southwestern part of Yemen, 256 kilometers south of the capital city Sana'a along the Red Sea coast overlooking the Bab Al-Mandab. The governorate is the most populous in Yemen and divided into 23 administrative districts, with the city of Taiz as the capital. 2 schools and 2 healthcare facilities will be supported under this subproject in Taiz, facilities are distributed across 4 districts namely Al-Mawast, Mashra'ah wa Hadnan, Dhubab and Al-Ma'afer. According to the 2014 Household Budget Survey, the poverty rate in Taiz governorate was 41%. After years of ongoing military confrontations, the poverty rate has increased sharply in the governorate.

Population;

2023 Estimated population in the governorate and the targeted districts under the subproject is below:

	Total IDP	Estimated Population	Total Females	Total Males
Taiz governorate	444,740	3,262,271	1,780,917	1,481,754
Districts (Al-Mawast, Mashra'ah wa Hadnan, Dhubab, Al-Ma'afer)	44,535	383,608	220,648	162,960

Temperature [21]

The summers are long, warm, and overcast; the winters are short, cool, windy, and mostly clear; and it is dry year-round. Over the course of the year, the temperature typically varies from 12°C to 29°C and is rarely below 9°C or above 31°C.

The warm season lasts for 4.1 months, from May 7 to September 10, with an average daily high temperature above 27°C. The hottest month of the year is June, with an average high of 29°C and low of 19°C. The cool season lasts for 2.6 months, from November 30 to February 17, with an average daily high temperature below 22°C. The coldest month of the year is January, with an average low of 12°C and high of 21°C.

Rainfall

The rainy period of the year lasts for 5.8 months, from April 5 to September 29, with a sliding 31-day rainfall of at least 13 millimeters. The month with the most rain is August, with an average rainfall of 29 millimeters. The rainless period of the year lasts for 6.2 months, from September 29 to April 5. The month with the least rain is December, with an average rainfall of 4 millimeters.

[21] Temperature, rainfall, wind and solar energy sourced from:
https://weatherspark.com/y/103129/Average-Weather-in-Al-%E2%80%98Ayn-Yemen-Year-Round

Wind

The average hourly wind speed experiences significant seasonal variation over the course of the year. The windier part of the year lasts for 1.8 months, from June 30 to August 24, with average wind speeds of more than 3.8 meters per second. The windiest month of the year is July, with an average hourly wind speed of 4.6 meters per second. The calmer time of year lasts for 10 months, from August 24 to June 30. The calmest month of the year is September, with an average hourly wind speed of 2.8 meters per second.

Solar Energy

The average daily incident shortwave solar energy experiences some seasonal variation over the course of the year. The brighter period of the year lasts for 2.4 months, from February 22 to May 2, with an average daily incident shortwave energy per square meter above 6.8 kWh. The brightest month of the year is March, with an average of 7.1 kWh. The darker period of the year lasts for 2.3 months, from June 29 to September 9, with an average daily incident shortwave energy per square meter below 5.5 kWh. The darkest month of the year is July, with an average of 5.1 kWh.

4. Environmental and Social Risks and Impacts

While significant positive environmental and social impacts will be resulted from this subproject, minor and temporary negative risks and impacts could be resulted. Such negative risks and impacts can be included under two main categories as explained in sections 4.1 and 4.2 below. First category is related to the facilities status, system design and operation while the second category is related to the contractors works and systems installation at the targeted facilities. The estimated risk level of the subproject is moderate and it involves temporary and minor impacts resulting from the contractor works and system installation and operation, list of risks and impacts are detailed in sections 4.1 and 4.2 below.

4.1. Facility Status, System Design and Operation

Potential risks and impacts associated with the facilities selection, system design and operation include:

- Facilities existing condition and the potential noncompliance with the building local regulations.
- Buildings' structures that might be affected and overloaded by the solar panel structure.
- Roof capacity and adequacy to withstand the solar panel structures.
- Inadequate electrical network connection that might be overloaded with the planned power supply.
- Although rare, design flaws, component defects, and faulty installation can cause solar rooftop or battery fires.
- Poor PV solar system components.
- Generated waste from the system components and improper handling or disposal.
- Fires within the different solar system components, wirings and equipment.
- Electrocution and personnel injuries.

4.2. Contractor Work and System Installation

Environmental Risk and Impacts

- Solid waste production that could pollute the environment.
- Exposure to extreme weather conditions such as cold or hot temperatures, rain, etc.
- Hazardous substances that could be used and improperly disposed of.
- Dust generation and air pollution.

Social Risk and Impacts

- Forced labor at the solar system components supply chain and production.
- Damage of existing installation as a result of contractor work.
- Security risks and social conflicts.
- Restricted access of local communities and beneficiaries to the facilities due to contractor work.
- Lack of worker's awareness and knowledge on social issues on gender, SEA/SH and GBV.
- Child labor.
- Community health and safety and exposure to critical activities (lifting, excavation, electrical work, work at height).
- Communities exposure to diseases and COVID-19 transmission.

Occupational Health and Safety Risks and Impacts

- Working at height impacts including serious injuries caused by falling from heights or falling objects.
- Improper working conditions such as lack of insurance, improper workers GM system, lack of training and lack of sanitation premises for the contractors workers.
- Lifting operations impacts resulted from failure of lifting equipment or falling.
- Slip, trip and fall.
- Electricity work impacts including electrocution/electric shock, fire and burns.
- Exposure to dust.
- Exposure to hazardous substances and wastes.
- Manual handling that could result in serious injuries.
- Infection by COVID-19.
- Exposure to sharp objects, heat.

5. Risks and Impacts Management and Monitoring

5.1. Facilities Status, System Design and Operation

5.1.1. Life and Fire Safety Measures

Life and Fire Safety Measures have been considered by UNOPS during the various stages of this subproject as below:

- **Life and Fire Safety Measures - Assessment Stage**

This stage has been been already completed by UNOPS for all facilities under this subproject in which the following took place:

  - Appropriate selection and determination of the system capacity, components and accessories required for the facilities considering the estimated power consumption.
  - Identify the location of system components in safe and adequate areas in coordination with facilities management.
  - Detailed assessment of facilities conducted by UNOPS engineers to ensure integrity and readiness for the system installation and operation.
  - Location of panels, batteries and associated system components selected by UNOPS engineers after detailed evaluation of the facility premises in coordination with the facility management and workers.

- **Life and Fire Safety Measures - System Specifications and Design**

This stage has been completed by UNOPS for all facilities under this subproject **in which the following**

took place:

- UNOPS ensured that high quality equipment and cables standard outdoor and indoor are applied.
- Ensure that high quality circuit breakers, cables, and alarm systems are included in the system design.
- Ensure that the system design and capacity is compatible with the facility consumptions and expected needs.
- Include in the design the safety aspects and protection including overload, short circuits, alarm and ventilation systems.
- Mounting structure designed to withstand the expected weather conditions and the building's structure capable of being loaded with the mounting structures and panels.
- The system design includes various safety aspects including the selection of materials, appropriate load and equipment specification following the international standards, design requirements and guidelines are included in annex 2.

- **Life and Fire Safety Measures - System Installation and Operation**

UNOPS will ensure the **following** will take place during the contractor work, system installation, test, **commissioning, startup and handover:**

- Ensure all components are meeting the design criteria.
- Close monitoring of the contractor work and ensure the system specifications and installation are meeting the subproject requirements.
- Earthing system testing and installation.
- Ventilation system provision, installation and operation within the battery compartment rooms.
- Detection and fire alarm system installation, test and operation within the battery compartment rooms.
- Fire-extinguishers to be delivered and installed as part of the subproject scope.
- Compartmentation to prevent or slow down the spread of fire and smoke will be applied in the battery room.
- Emergency response actions to be developed and introduced to facilities management.
- Solar System Monitoring Unit installation to detect any malfunction and shut down the solar system and record the system faults log.
- Access to system components and battery areas will be restricted to authorized personnel only.
- Conduct comprehensive training for the staff and technicians responsible for the operation on the safety aspects as well as the appropriate operation and maintenance. Contractor work includes detailed training to be conducted to the facilities workers on the safe operation and maintenance as explained in the section 2.3 with close follow up monitoring and evaluation by UNOPS. All training materials and trainers qualifications shall be reviewed and approved by UNOPS
- Training sessions that will be conducted with the facilities include detailed explanation on the system components waste generation and recycling requirements. Continued support will be maintained to the facilities by UNOPS during the Project lifetime.
- Complete set of the system documentations, as built drawings with detailed information on the various operation and maintenance activities as well as the waste management process will be handed over to the facilities management.
- PV solar system code of practice is available in annex 3 in which the various aspects related to the system operation and management of batteries is included.

- The system will be fully handed over to the facilities management and local authorities once the system is installed, commissioned, started and tested. Facilities management will be fully responsible for the system operation and assignment of staff responsible for system operation. Support including preventive maintenance will be continued during the system warranty period (1 year).
- Product warranty of the system components vary between 1 to 10 years in which the facilities management will be provided with detailed information on the recycling/disposal options at each components end of life.

5.1.2. Management of System Generated Waste

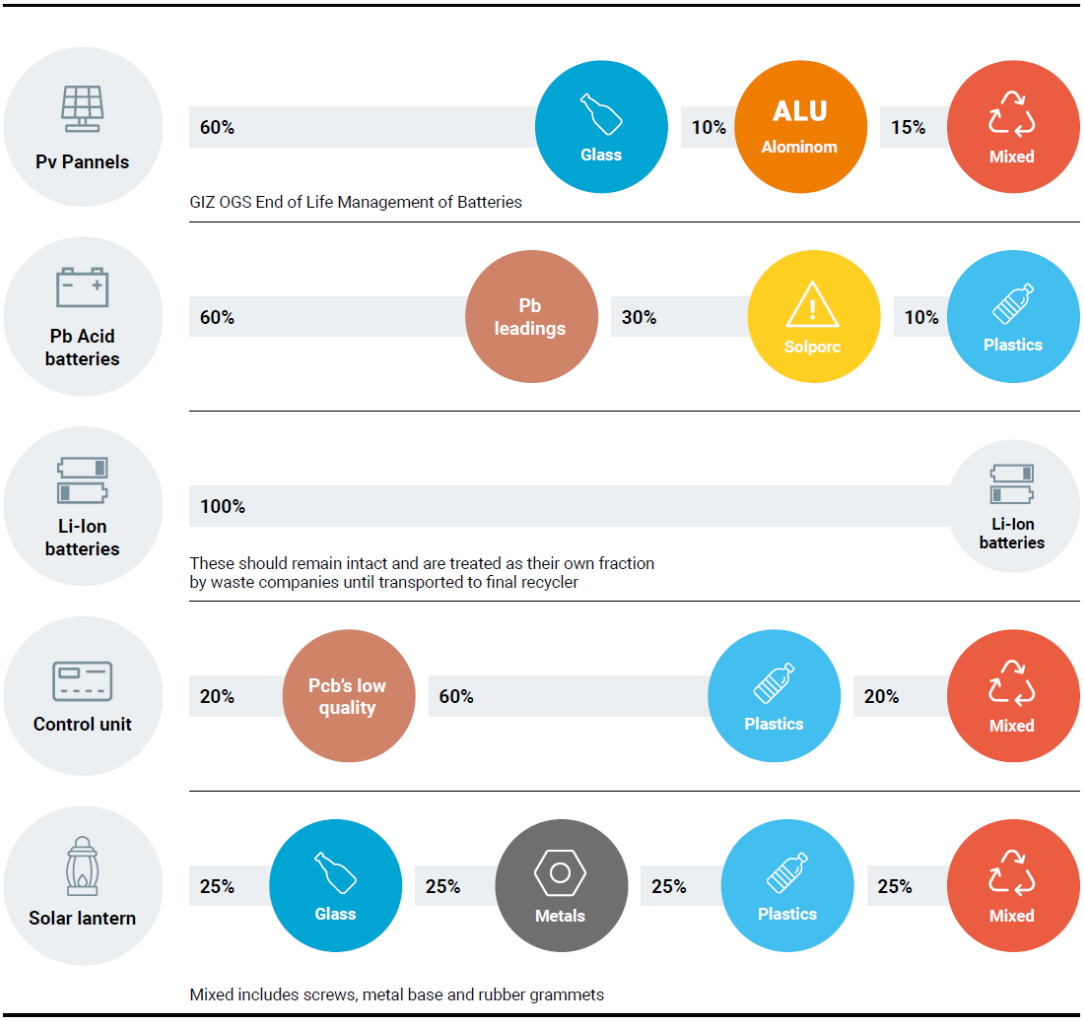
The main components of an off-grid solar product include PV solar modules, batteries (lithium-based or lead acid), lamps (mainly LED), control units with circuit-board-mounted electronic controls, cables, metal frames and fixtures, and appliances (TVs, radios, fans, etc.) (GOGLA, 2019). [22], [23] After becoming waste, the components of the off-grid solar products are grouped according to fractions such as metal, glass, plastics, paper and cardboard, and cables. Figure 4 provides an overview of fractions of off-grid solar products and the waste components (GOGLA, 2019)[24].

[22] GOGLA (2019a). E-waste Toolkit Module 1 Briefing Note: Technical introduction to recycling of off-grid products. www.gogla.org/e-waste/introductionto-recycling

[23] GOGLA is a global association for the off-grid solar energy industry. It chairs an E-waste Circularity Working Group with GOGLA members, companies, investors, manufacturers, universities, and research institutes, which acts as a consultation group for developing learning output and sector guidance, through particular themes (repairability, standardized product labelling for disposal), and sharing best practices, problems, and solutions.

[24] The text and figure 4 are extracted from the Project ESMF page 35.

Figure 4 the waste components of off-grid solar (GOGLA, 2019)



Detailed explanation on the actions needed to manage the various solar system components will be included in the training and awareness sessions that will be provided to the facilities by the contractors as detailed in table 4 hereinafter with continuous support from the UNOPS during the Project lifetime.

5.1.3. Project Grievance Mechanism

UNOPS has established a GM system for the YEEAP 2 to enable beneficiaries to communicate their concerns regarding the planned activities and what improvement is needed in the scope.

Multiple access points to the GM system are provided for beneficiaries to voice their concerns. These access points will be advertised in Arabic at subproject level and put on the sign boards on each subproject site, and include GM contact information including toll free number, landline, mobile SMS, email and website:

Address	Haddah Street, former European Union Office Building, Sana'a
Toll Free Number	8000190
Landline	01 504914 and 01 504915
SMS and WhatsApp	739888388
Email	grm-yemen@unops.org
Website	www.unops.org

5.1.4. GBV/SEA/SH

Although with low magnitude and occurrence probability due to the cultural aspects in the country as well as the limited work intervention under the subproject, UNOPS has already taken the following steps in regards the GBV/SEA/SH issues in which it will be maintained during the subproject implementation:

- During the stakeholder engagement activities including the meetings with the potential contractors, the project GBV SEA/SH Prevention and Response Action Plan has been discussed. The consultations highlighted how the GBV GMs is intended to be secured, and confidential with a focus on a survivor-centered approach.
- UNOPS has developed visibility materials to promote awareness for SEA/SH in local language (Arabic) the materials and messages used are adapted to be suitable for the Yemen context and sensitivity of the subject.
- Project GM focal point received specialized training about SEA/SH cases and the way to deal with it using Victim centered approach
- UNOPS has in place protocol for GM in how to deal with SEA/SH cases with a referral pathway as included in the GBV prevention and response action plan.
- UNOPS is conducting regular refresher awareness sessions for Project Personnel and retainers' sites engineers on the GBV/SEA/SH.
- UNOPS has prepared risk assessment tools for GBV and will require contractors to fill out a checklist on GBV/SEA/SH and to prepare a code of conduct for their workers/staff.
- As part of the YEEAP GBV SEA/SH prevention and response action plan UNOPS will roll out SEA/SH prevention and response plans for contractors, where the contractors need to prepare the action plan as part of the tender documents. UNOPS is supporting to enhance the contractors' capacity in this area. Hence, UNOPS developed a contractors' action plan template, which covers the most priority areas. Moreover, UNOPS conducted an induction session for contractors about this requirement and presented to contractors on how to prepare their own GBV SEA/SH prevention and response plans (GBV Action Plans) using the developed template. In addition, in depth training sessions will follow and will continue during the project life cycle.

5.2. Forced Labor in the System Components Supply Chain

Reference to the Project LMP where specific actions are included to prevent any forms of forced labor during the Project implementation, the following will be included in the bidding and contracting documents of this subproject:

(i) The bidders applying to any of UNOPS tenders shall provide UNOPS with a declaration form on forced labor prevention, declaration form is available in annex 4. Such a declaration form will be requested from the bidders who will apply for the bid, UNOPS will not deal with any supplier or manufacturer unless they apply for the bids.

(ii) The Contractor shall comply with all applicable laws concerning terms of employment and conditions of work, and any collective agreements to which it is party.

(iii) The Contractor shall not engage, directly or indirectly, in "Forced Labor," i.e., by exacting work or service from any person under the threat of a penalty and for which the person has not offered himself or herself voluntarily.

(iv) The Contractor shall not engage, directly or indirectly, in "Trafficking in Persons," i.e., by recruiting, transporting, transferring, harboring or receiving persons by threat or use of force or other forms of coercion, abduction, fraud, deception, or abuse of power.

(v) Whenever Forced Labor or Human Trafficking occur in the Contractor's operations, including in its supply chain, the Contractor shall, as soon as reasonably practicable, take all reasonable action to address or remove these occurrences, including where relevant, by addressing any practices of other entities in its supply chain.

(vi) Failure by the Contractor to abide by the provisions of these requirements shall entitle the

UNOPS to terminate the Contract or any other contract with the United Nations immediately upon notice to the Contractor, without any liability for termination charges or any other liability of any kind.

5.3. Contractor Works and System Installation in Targeted Facilities

Contractors Obligations

The bidders for this subproject will be requested to prepare a Preliminary Environmental and Social Management Plan as part of their offers, outlining the principles and the methodology that they will use to meet ESHS requirements, and that they include the full cost of all the actions necessary to meet ESHS requirements in their submissions. The quality of the provided plans, as well as past environmental and social performance, and capacity to meet ESHS requirements, will be considered when selecting contractors.

Once the contract is awarded, the Contractor shall prepare and submit to UNOPS for approval a Contractor Environmental and Social Management Plan (C-ESMP), including the following sections or subplans:

- ESHS training
- Site management
- Occupational Safety and Health
- Road safety and Traffic Safety
- Emergency Preparedness and Response
- Labor force management, Workers Grievance Mechanism and Code of Conduct
- Stakeholder Engagement
- Contractor Environmental and Social Reporting
- Solar PV Systems
    - Include in the C-ESMP a detailed explanation of how the contractor's performance will meet the ESHS requirements as defined in the contract bidding documents
    - Include in the C-ESMP an organization chart of the personnel assigned to environmental and social management
    - Ensure that sufficient funds are budgeted to meet the ESHS requirements, and that sufficient capacity is in place to oversee, monitor and report on C-ESMP performance.
    - Put in place controls and procedures to manage their ESHS performance
    - Prepare GBV/SEA/SH prevention and response action plan

UNOPS will also require that contractor to:

- Inspect existing facilities and apply all safety measures to reduce the risk of any injury to the workers during installation or the users during operation, subject to written approval by the UNOPS engineer provided before implementation of work.
- Contractor work and implementation period in the schools and healthcare facilities to be arranged in coordination with the facilities managements and UNOPS engineers.
- Workers presence and site work in the supported schools to be performed during the schools and students off days (vacations, official holidays, summer breaks,..etc).
- Install ladders or external access points at the facilities require such additional access points following the design and BoQ requirements.
- Conduct risk assessment for solar system installation, evaluate the risk, and put the appropriate safety measures in place and submit it for review and approval.
- Fully implement UNOPS permit to work system (to ensure all hazards / mitigation measures required for tasks implementation are properly identified) method of statement and job safety analysis to ensure all tasks are well prepared and follow all necessary safety mitigation and prevention measures.

- Provide safety training to all workers including working at height, lifting operations, electrical shock safety and permit to work before commencing any work
- Provide fully insulated PPE, isolated installation tools, instruments, and equipment.
- Ensure proper use of ladders and scaffolds by trained employees, apply regular inspection and testing, use of fall prevention devices, including safety belt and lanyard travel limiting devices to prevent access to fall hazard area, or fall protection devices such as full body harnesses used in conjunction with shock absorbing lanyards or self-retracting inertial fall arrest devices attached to fixed anchor point or horizontal lifelines.
- The contractor shall sign the UN/UNOPS CoC and all contractor personnel shall sign and comply with the personnel CoC, annex 5 includes a sample personnel CoC.
- The contractors must also comply with the project LMP, including the establishment and maintenance of a grievance redress mechanism for workers.
- The mitigation measures and monitoring plan for contractor work is available in table 4 in which close follow up will take place during the subproject implementation.

Grievance Mechanism for Workers

The Contractor shall put in place a Grievance Mechanism for its workers and the workers of its subcontractors that is proportionate to its workforce. The GM for workers shall be distinct from the Project level Grievance Mechanism for affected individuals and communities, and shall adhere to the following principles:

- *Provision of information.* All workers should be informed about the grievance mechanism at the time they are hired, and details about how it operates should be easily available, for example, included in worker documentation or on notice boards.
- *Transparency of the process.* Workers must know to whom they can turn in the event of a grievance and the support and sources of advice that are available to them. All line and senior managers must be familiar with their organization's grievance procedure.
- *Keeping it up to date.* The process should be regularly reviewed and kept up to date, for example, by referencing any new statutory guidelines, changes in contracts or representation.
- *Confidentiality.* The process should ensure that a complaint is dealt with confidentiality. While procedures may specify that complaints should first be made to the workers' line manager, there should also be the option of raising a grievance first with an alternative manager, for example, a human resource (personnel) manager.
- *Non-retribution. Procedures* should guarantee that any worker raising a complaint will not be subject to any reprisal.
- *Reasonable timescales*. Procedures should allow for time to investigate grievances fully, but should aim for swift resolutions. The longer a grievance is allowed to continue, the harder it can be for both sides to get back to normal afterwards. Time limits should be set for each stage of the process, for example, a maximum time between a grievance being raised and the setting up of a meeting to investigate it.
- *Right of appeal.* A worker should have the right to appeal to the UNOPS or national courts if he or she is not happy with the initial finding.
- *Right to be accompanied*. In any meetings or hearings, the worker should have the right to be accompanied by a colleague, friend or union representative.
- *Keeping records*. Written records should be kept at all stages. The initial complaint should be in writing, if possible, along with the response, notes of any meetings and the findings and the reasons for the findings.
- Any records on SEA shall be registered separately and under the strictest confidentiality.

Table below provides the actions and mitigation measures that should take place by the contractor at each facility during the solar system installation. Estimated cost of mitigation measures implementation in each facility is included in section 5.5 which should be fully covered by the contractor as part of the subproject and BoQ items cost.

Table 4 Contractor work mitigations and monitoring plan

Mitigation Measures and Contractor Obligations	Monitoring Parameters	
	Indicators	Responsibility
1. Working Site Management		
1.1. Access, and implementation arrangement		
- Ensure the safety and security of the site and maintain safe workers' access. - Contractor shall inspect existing facilities and apply all safety measures to reduce the risk of any injury to the workers during installation or the users during operation, subject to written approval by the UNOPS engineer provided before implementation of work. - Contractor work and implementation period in the schools and healthcare facilities to be arranged in coordination with the facilities managements and UNOPS engineers. - Workers presence and site work in the supported schools to be performed during the schools and students off days. - Appropriate and totally separated access for workers to the work areas to be maintained. Install warning signs in Arabic language. - Limit work sites with safety tape, fencing or barricades, as appropriate, to prevent unauthorized access to the working sites - Safeguard public safety by covering holes and by installing guardrails along temporary pathways or ground areas that is located under the buildings roof or work areas - Coordinate working hours and arrangements with the facility management and to avoid/limit any disturbance to the facility operation. - Maintain safe access to public and private properties that might be affected by Project activities. If necessary, provide acceptable alternative means of passage or access to the satisfaction of the persons affected. - Avoid working during night hours or during the peak of services provisions.	- Safety and security of work location - Unauthorized personnel presence in or around the work areas - Separate access for workers is available and maintained. - Public access availability - Public grievances on the facility work disturbance - Presence of signs and barriers around the work area	UNOPS engineer / HSSE officer (weekly) Contractor Supervisor (Daily)
1.2. Protection of Existing Installations		
- Safeguard all existing buildings, structures, works, pipes, cables, sewers, or other services or installations from harm, disturbance or deterioration during activities.	- Appropriate arrangement of work areas.	UNOPS engineer / HSSE officer (weekly)

Mitigation Measures and Contractor Obligations	Monitoring Parameters	
	Indicators	Responsibility
- Coordinate with facilities management to identify existing infrastructure that might not be visible - Repair any damage caused by the Contractor's activities, in coordination with concerned authorities. - Install retaining nets to hold falling debris during activities where needed.	- Separate access for workers is available and maintained. - Facility operation is continued	Contractor Supervisor (Daily)
1.3. Waste from Activities		
- Collect and properly manage all solid wastes resulting from subproject activities. - Perform waste segregation and the generated waste from the activities shall not be mixed with the facility generated waste. - Reduce waste generation and recycle all waste that can be recycled. - Properly dispose of solid waste and debris at designated permitted waste disposal sites allocated by the local authorities. - Remove all debris and waste after work completion.	- Waste accumulation in and around the work area - Lack of waste bins and segregation means - Public grievances and complaints on waste accumulation	UNOPS engineer / HSSE officer (weekly) Contractor Supervisor (Daily)
1.4. Hazardous Substances Handling		
- Train workers regarding the handling of hazardous materials - Label using easily understandable symbols, and provide material safety data sheets, for chemical substances and mixtures according to the Globally Harmonized System (GHS) of classification and labeling of chemicals - Store hazardous materials as per the statutory provisions of the Manufacturer's guidelines - Treat hazardous waste separately from other waste - Avoid the storage or handling of toxic liquid adjacent to or draining into drainage facilities - Keep absorbent materials or compounds on Site in sufficient quantities corresponding to the extent of possible spills - Select disposal sites of solid waste in coordination with the relevant authorities	- Workers training records - Appropriate storage is maintained for hazardous substances	UNOPS engineer / HSSE officer (weekly) Contractor Supervisor (Daily)
2. Occupational Health and Safety		
2.1. Working at Heights		
The contractor shall implement fall prevention and protection measures whenever a worker is exposed to the hazard of falling more than two meters, or through an opening in a work surface. The Contractor shall:	- Workers training records - Workers awareness - Near misses or injuries	UNOPS engineer / HSSE officer (weekly) Contractor Supervisor (Daily)

Mitigation Measures and Contractor Obligations	Monitoring Parameters	
	Indicators	Responsibility
- Install guardrails with mid-rails and toe boards at the edge of any fall hazard area - Train workers on the proper use of ladders and scaffolds - Install fall prevention devices, including safety belt and lanyard travel limiting devices to prevent access to fall hazard area, or fall protection devices such as full body harnesses used in conjunction with shock absorbing lanyards or self-retracting inertial fall arrest devices attached to fixed anchor point or horizontal life-lines - Train workers in the use, serviceability, and integrity of the necessary PPE - Include rescue and recovery plans, and equipment to respond to workers after an arrested fall	resulted from work at height - Work at height areas are well secured and protected - Availability of PPE related to work at height	
2.2. Slip, trip and fall		
- Implement good house-keeping practices, such as the sorting and placing loose materials or debris in established areas away from footpaths - Clean up excessive waste debris and liquid spills regularly - Locate electrical cords and ropes in common areas and marked corridors - Ensure that workers use slip retardant footwear - Restrict access, barricade or implement any equivalent measure to limit workers access to areas where sharp or hard objects exist	- Site cleanliness, tidiness and overall condition - Access restriction maintained to authorized personnel - Record of worker injuries	UNOPS engineer / HSSE officer (weekly) Contractor Supervisor (Daily)
2.3. Manual handling and transportation of materials		
- Avoid manual handling activities to the possible extent. - Reduce the load risk by using lighter weights or more stable containers. - Reorganize the activity to further reduce the risk on the individual(s). - Utilize mechanical lifting aids or equipment as appropriate. - Ensure appropriate rest breaks, job rotation and training for workers. - Provide PPE to the workers on a regular basis (e.g. gloves, foot protection, and non-slip footwear)	- Availability and implementation of the mechanical lifting - Workers injuries due to manual handling -	UNOPS engineer / HSSE officer (weekly) Contractor Supervisor (Daily)
2.4. Working on electrical appliances and equipment		
- Apply electrical isolation prior to the work on any electrical equipment - Workers shall use electrical PPE including the appropriate gloves and face protection. - Carry out tests prior the implementation of any work on electrical equipment - Ensure all equipment or tools used in the activities implementation are maintained, certified and in good condition.	- Workers qualification - Workers training on electrical hazards, risks and impacts - Incidents related to the	UNOPS engineer / HSSE officer (weekly) Contractor Supervisor (Daily)

Mitigation Measures and Contractor Obligations	Monitoring Parameters	
	Indicators	Responsibility
- Ensure all connections and equipment are secured. - Apply earthing when using the portable electrical equipment. - Only authorized and certified workers shall implement electrical related activities. - Provision of training to all workers on the electrical risks, impacts and mitigation measures. - Avoid working in rainy seasons.	work on electrical appliances. - Electrical PPE availability and adherence -	
2.5. Lifting		
- Usage of certified and inspected equipment that is capable of handling the loads. Endure the loads are well secured during lifting operation - Lifting equipment to be mounted on stable and protected ground. - Ensure the areas around lifting operation are free of personnel, obstacles with restricted access - Ensure all appliances used during lifting operation are in good condition without any visible defect. - Ensure the qualified personnel are carrying out the lifting operations. - Arrange the operation with the UNOPS area engineer and the facility management. - Avoid working in extreme weather conditions and at high wind speed.	- Certified lifting devices - Presence of qualified personnel - Incidents that are resulted from lifting activities.	UNOPS engineer / HSSE officer (weekly) Contractor Supervisor (Daily)
2.6. Noise		
- The use of hearing protection should be enforced actively for any noisy work . - Rotate staff to limit individual exposure to high levels. - Install practical acoustical attenuation on equipment, such as mufflers. - Use silenced air compressors and power generators - Post signs in all areas where the sound pressure level exceeds 85 dB(A). - Shut down equipment when not directly in use - Provide advance notice to occupants if an activity involving high level impact noise is in close proximity to buildings.	- Nuisance environment - Public and facility users complains - Workers grievances - Ear protection availability and workers adherence - Medical records	UNOPS engineer / HSSE officer (weekly) Contractor Supervisor (Daily)
2.7. Hot work		
- Provide proper eye protection such as goggles and/or a full-face eye shield, heat resistant gloves, for all personnel involved in any hot work operations. Additional methods may include the use of barrier screens around the specific workstation (a solid piece of light metal, canvas, or plywood - Work area to be restricted to authorized personnel. - All equipment and tools shall be tested and certified.	- Incidents and injuries related to hot work	UNOPS engineer / HSSE officer (weekly)

Mitigation Measures and Contractor Obligations	Monitoring Parameters	
	Indicators	Responsibility
2.8. Personal Protective Equipment		
- Identify and provide at no cost appropriate PPE to workers, the workers of subcontractors, as well as to visitors, which gives adequate protection without incurring unnecessary inconvenience to the individual, including helmets, safety boots, gloves, goggles, safety jackets, and N95 masks, as well as body coverall, gloves, respirators with filters, and goggles in the case of contaminated sites - Ensure that the use of PPE is compulsory - Provide sufficient training in the use, storage and maintenance of PPE to its workers and workers of its subcontractors - Properly maintain PPE, including cleaning when dirty and replacement when damaged or worn out. - Determine requirements for standard and/or task-specific PPE based on Job specific Safety Analysis. - Consider the use of PPE as a last resort when it comes to hazard control and prevention, and always refer to the hierarchy of hazard controls when planning a safety process	- PPE availability at work area - All workers are aware of and use the PPE as recommended - PPE distribution records - Training records on the PPE usage	UNOPS engineer / HSSE officer (weekly) Contractor Supervisor (Daily)
2.9. Covid-19 transmission among workers and communities		
- Ensure adherence to COVID-19 precautionary measures by all workers. - Ensure face masks are available and used by all workers. - Ensure awareness sessions are conducted on COVID-19 with all workers. - Ensure availability of hygiene kits, soap, clean water - Ensure social distancing is applied in the worksite.	- Awareness session records on the COVID-19 - COVID-19 infections cases among workers	UNOPS engineer / HSSE officer (weekly) Contractor Supervisor (Daily)
2.10. Provision of water and sanitation premises for the workers		
- Provide adequate lavatory facilities (toilets and washing areas) for the number of people expected to work at the sites. - Provide toilet facilities with adequate supplies of running water, soap, - Provide separate toilets for women workers at the worksite, if employed - Workers are not allowed to use the sanitation premises of the facilities without prior agreement and approval of the facility management and users. - Provide adequate supplies of potable drinking water - Ensure that water supplied meets drinking water quality standards	- Sanitation premises availability - Complaints from the facilities and workers complaints and grievances	UNOPS engineer / HSSE officer (weekly) Contractor Supervisor (Daily)

Mitigation Measures and Contractor Obligations	Monitoring Parameters	
	Indicators	Responsibility
3. Labor Force Management		
3.1. Labor and working conditions		
- Provide all workers with terms and conditions that comply with Yemeni labor legislation, LMP and applicable regulations. - Hire workers through transparent process and recruitment offices, where feasible, and avoid hiring "at the gate" to discourage spontaneous influx of job seekers - Put in place workplace processes for workers to report work situations that they believe are not safe or healthy, and to remove themselves from a work situation which they have reasonable justification to believe presents an imminent and serious danger to their life or health. - Ensure that children and minors are not employed directly or indirectly on the subproject, and keep registration and proof of age for all employees on-site. - Avoid all forms of forced or compulsory labor, i.e., all work or service which is exacted from any person under the threat of a penalty and for which the person has not offered himself or herself voluntarily. - Develop and adopt a Gender Action Plan following the Project requirements and template	- Workers grievances - Workers registers and qualification - Appropriate working conditions are provided - Adopt Code-of-Conduct	UNOPS engineer / HSSE officer (weekly) Contractor Supervisor (Daily)
3.2. Insurance		
- Provide insurance for all employees involved in the subproject as indicated by Yemen's Labor Law - Compensate any employee for death or injury.	- Workers insurance evidence - Workers complaints and grievances	UNOPS engineer / HSSE officer (at the start of the work)
3.3. Grievance Mechanism for workers		
- The Contractor shall put in place a Grievance Mechanism for its workers and the workers of its subcontractors that is proportionate to its workforce.	- Visible mechanism channels - Register of grievances with the resolutions	UNOPS engineer / HSSE officer (weekly)
3.4. Child labor prevention		
- Verify that workers are older than 18 when hiring and exclude all persons under the age of 18. - Review and retain copies of verifiable documentation concerning the workers age	- Presence of child labors - Workers register with age documentary	UNOPS engineer / HSSE officer (weekly)

Mitigation Measures and Contractor Obligations	Monitoring Parameters	
	Indicators	Responsibility
	records	
3.5. Sexual harassment, abuse, gender-based violence, and discrimination		
- Provide regular training and awareness raising to the workforce about refraining from unacceptable conduct toward local community members, specifically women - Inform workers about national laws that make sexual harassment and gender-based violence a punishable offence which is prosecuted - Prohibit its employees from exchanging any money, goods, services, or other things of value, for sexual favors or activities, or from engaging any sexual activities that are exploitive or degrading to any person.	- Training records on the GBV/SEA/SH - Public grievances received through the project GM system - Facility users complaints - Contractor GBV/SEA/SH prevention and response action plan is in place and implemented.	UNOPS engineer / HSSE officer (weekly)
3.6. Code of Conduct		
- The Contractor shall ensure that all employees, including those of subcontractors, are informed about and sign the personnel Code of Conduct.	- Workers awareness on the CoC - Registers of workers signed the CoC	UNOPS engineer / HSSE officer (weekly)
4. Road safety and traffic safety		
- Ensure all work activities are not affecting the traffic and vehicles movement in the facility - Emphasize safety aspects among drivers - Improve driving skills and requiring licensing of drivers - Institute defensive driving training for all drivers prior to starting their job - Avoid dangerous routes and times of day to reduce the risk of accidents - Require that drivers and co-passengers wear seatbelts, and duly sanction defaulters. - Regularly maintain vehicles and use manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. - Ensure coverage of the tracks to prevent materials from falling	- Vehicle maintenance records. - Drivers qualification - Traffic incidents at the work area - Drivers adherence to the safe driving rules	UNOPS engineer / HSSE officer (weekly) Contractor Supervisor (Daily)
5. Emergency Preparedness and Response		

Mitigation Measures and Contractor Obligations	Monitoring Parameters	
	Indicators	Responsibility
- Ensure that qualified first-aid by qualified personnel is always available. Appropriately equipped first-aid stations should be easily accessible throughout the place of work. - Provide workers with rescue and first-aid duties with dedicated training so as not to inadvertently aggravate exposures and health hazards to themselves or their co- workers. Training would include the risks of becoming infected with blood–borne pathogens through contact with bodily fluids and tissue. - Provide eye-wash stations and/or emergency showers close to all workstations where immediate flushing with water is the recommended first-aid response. - Provide dedicated and appropriately equipped first-aid room(s) where the scale of work or the type of activity being carried out so requires. - Equip first aid stations and rooms with gloves, gowns, and masks for protection against direct contact with blood and other body fluids. - Make widely available written emergency procedures for dealing with cases of trauma or serious illness, including procedures for transferring patient care to proper medical facilities. - Immediately report all accidental occurrences with serious accident potential such as major equipment failures, contact with high-voltage lines, exposure to hazardous materials, slides, or cave-ins to UNOPS. - Immediately investigate any serious or fatal injury or disease caused by the progress of work by the Contractor, and submit a comprehensive report to UNOPS - Establish and maintain an emergency preparedness and response system, in collaboration with appropriate and relevant third parties including to cover: (i) the contingencies that could affect personnel and facilities under the subproject; (ii) the need to protect the health and safety of workers; (iii) the need to protect the health and safety of the Affected Communities. The emergency preparedness and response system shall include: ○ Identification of the emergency scenarios ○ Specific emergency response procedures ○ Training of emergency response teams ○ Training of workers on the actions to be taken in emergency situations ○ Emergency contacts and communication systems/protocols (including communication with Affected Communities when necessary) ○ Procedures for interaction with responsible authorities (emergency, health, environmental authorities)	- First aid kits availability - Emergency response plan availability - Drills records - Training records on the emergency preparedness	UNOPS engineer / HSSE officer (weekly) Contractor Supervisor (Daily)

Mitigation Measures and Contractor Obligations	Monitoring Parameters	
	Indicators	Responsibility
○ Permanently stationed emergency equipment and facilities (e.g., first aid stations, firefighting equipment, spill response equipment, personal protection equipment for the emergency response teams) ○ Protocols for the use of the emergency equipment and facilities ○ Clear identification of evacuation routes and muster points ○ Emergency drills and their periodicity based on assigned emergency levels or tiers ○ Decontamination procedures and means to proceed with urgent remedial measures to contain, limit and reduce pollution within the physical boundaries of the subproject property and assets to the extent possible.		
6. Stakeholders Engagement		
- As part of the overall Project Stakeholder Engagement, the Contractor shall undertake a process of stakeholder engagement before and during the work execution with facilities representative persons and communities directly affected by the activities it undertakes. - The Contractor shall also maintain throughout the implementation good relations with local communities and will give these communities prior notice of plans and schedules as they might affect local people.	- Stakeholders engagement activities records, outcomes	UNOPS engineer / HSSE officer (weekly)
7. Solar system management		
- Ensure that solar PV systems are installed by qualified and experienced trades people, in order to avoid or minimize electrocution and other health and safety issues associated with working with hazardous materials - The Contractor shall build awareness and provide training to beneficiaries and users of facilities with the aim of improving their understanding of the environmental and health issues associated with the battery life cycle, including end-of-life management; most particularly: - The safe handling of batteries including installation, removal, transport, storage and disposal - The environmental and health aspects of poor battery disposal - Information on the environmental and health issues associated with the highly toxic content of batteries and explanation as to why they must be stored, transported and disposed of in specific ways The Contractor shall train beneficiaries on the following measures before they handle batteries: - Prohibit unauthorized access to battery areas	- Presence of qualified staff among the contractors - Effectiveness and implementation of training sessions the facility workers - Facility workers awareness and knowledge on the system operation, maintenance and applicable precautions	UNOPS engineer / HSSE officer (weekly) and after work completion

Mitigation Measures and Contractor Obligations	Monitoring Parameters	
	Indicators	Responsibility
- Consult battery owners' manuals for instructions on battery handling and hazard identification - Wear personal protective equipment (PPE) such as chemical splash goggles and a face shield - Wear acid-resistant equipment such as gauntlet style gloves, an apron, and boots - Do not tuck pant legs into boots because spilled acid can pool in the bottom of your boots and burn your feet - Place protective rubber boots on battery cable connections to prevent sparking on impact if a tool does accidentally hit a terminal - Ensure that all metal tools (spanners, socket wrench drivers, etc.) that will come in contact with the battery terminals have metal handles taped with electrical tape or are protected by other means to help prevent inadvertent short circuits - Clean the battery terminals with a plastic brush because wire brushes can create static and sparks - Cover maintenance tools with several layers of electrical tape to avoid sparking - Replace batteries with a new one if they show signs of damage to the terminals, case or cover The Contractor shall train beneficiaries to follow the following measures to minimize risk: - Never lean over a battery while boosting, testing or charging it - If acid splashes on your skin or eyes, immediately flood the area with cool running water for at least 15 minutes and seek medical attention immediately - Always practice good hygiene and wash your hands after handling a battery and before eating - Wash your hands properly if you handle the lead plates in a battery to avoid exposure to lead. Signs of lead exposure include mood swings, loss of appetite, abdominal pain, difficulty sleeping, fatigue, headaches and loss of motor coordination. - Disconnect the battery cables before working on a battery. Be careful with flammable fluids when working on a battery-powered system. The electrical voltage created by batteries can ignite flammable materials and cause severe burns. Workers have been injured and killed when loose or sparking battery connections ignited gasoline and solvent fumes during system maintenance. - Before making wiring changes to the system, disconnect the battery, either through opening the circuit breaker or over-current device, or by disconnecting the cables. Adding distilled water or cleaning terminals can be done without disconnecting.		

5.4. Contractor Environmental and Social Reporting

The Contractor shall report major work-related incidents, accidents or loss of life to UNOPS **within 24 hours** of their occurrence.

The Contractor shall monitor, keep records and report to UNOPS on weekly and monthly basis on the following environmental and social issues:

- Safety: first aid cases, high potential near misses, and remedial and preventive activities required (for example, revised job safety analysis, new or different equipment, skills training, and so forth).
- Environmental incidents and near misses: environmental incidents and high potential near misses and how they have been addressed, what is outstanding, and lessons learned.
- Major activities: those undertaken and completed, progress against implementation schedule, and key work fronts (work areas).
- ESHS requirements: noncompliance incidents with permits and national law (legal noncompliance), commitments, or other ESHS requirements.
- ESHS inspections and audits: by the Contractor—to include date, inspector or auditor name, sites visited and records reviewed, major findings, and actions taken.
- Workers: list of workers at each site, confirmation of ESHS training, indication of origin (expatriate, local, nonlocal nationals), gender, age with evidence that no child labor is involved, and skill level (unskilled, skilled, supervisory, professional, management).
- Training on ESHS issues: including dates, number of trainees, and topics.
- Footprint management: details of any work outside boundaries or major off-site impacts caused by ongoing activities—to include date, location, impacts, and actions taken.
- Stakeholder engagement: highlights, including formal and informal meetings, and information disclosure and dissemination—to include a breakdown of women and men consulted and themes coming from various stakeholder groups, including vulnerable groups (e.g., disabled, elderly, children, etc.).
- Details of any security risks: details of risks the Contractor may be exposed to while performing its work—the threats may come from third parties external to the project.
- Worker grievances: details including occurrence date, grievance, and date submitted; actions taken and dates; resolution (if any) and date; and follow-up yet to be taken—grievances listed should include those received since the preceding report and those that were unresolved at the time of that report.

5.5. ESMP Implementation Budget

The contractors shall cover the cost of their workers, training, PPE provision and mitigation measures implementation as part of the overall subproject BoQ items implementation cost. Estimated budget is available below.

Table 5 Estimated budget

Item	Cost per facility US$	Cost for all facilities US$
Travel of UNOPS team to the subproject areas for monitoring and supervisory.	300	26,700
Mitigation measures implementation estimated cost	800	71,200
Total	**1,100**	**97,900**

6. Consultation Details

Various levels of consultations were conducted under the subproject and it includes the local authorities, facilities management and other stakeholders including community leaders and communities neighboring the facilities. The consultation on the system components, installation process, requirements and timeframe took place with the facilities management and involved workers by the Project Engineers during the assessment stage. Moreover, further consultations conducted by the Project Female Social Facilitators at facility level in August and September 2022, available in sections 6.1 for healthcare facilities and section 6.2 for schools. The consultation process takes the form of semi-structured discussions by phone calls, interviews with the staff of the targeted health and educational facilities and communities both males and females, and feedback was collected by questionnaires. The interview started with a brief explanation of the nature and objective of the sub-projects and potential impacts with proposed mitigation measures.

Table 6 Consulted People Summary

Facilities Type	Workers			Communities / Neighbors			Total
	M	F	Total	M	F	Total	
Healthcare facilities	165	101	266	81	30	111	375
Schools	106	125	231	62	35	97	328
Total	271	226	497	143	65	208	703

The topics of the consultations include:

- Inform participants about the activities to be undertaken and the sub-projects timetable;
- Document and address local beneficiaries' concerns, expectations and feedback;
- Ensure full participation of subproject beneficiaries both females and males and provide them with awareness on the GM contact channels, anonymous complaints and escalation of grievances if not satisfied with the resolution and action taken.
- Discuss the subproject positive impacts that the subprojects will have and the potential negative impacts and proposed prevention and mitigation measures.
- Provide awareness to the participants on their rights to raise any concerns related to the subproject' implementation during the various phases.

Close coordination was made with the facilities management, local officials and community leaders to ensure all affected parties are involved in the consultation including women and neighboring communities.The participants have emphasized on the importance of providing high quality system components in addition to maintaining the operation of services during the system installation. The participants appreciated the support of supplying and installing solar systems in their facilities that will result in a sustainable and clean source of energy and help in the improvement of health and educational services quality. All safety mitigation measures were discussed in detail with the consulted persons.

Summary of the main outcomes from the consultation activities at health facilities and schools are:

- The importance of accelerating the implementation process of the solar system installation to serve the communities and to allow full operation of the equipment/devices that can serve the communities.

- It will be necessary to select appropriate and high quality system components including the solar panels and batteries that can operate for a long time with minimum malfunction.
- The system and generation capacity need to meet the maximum power consumption rates at the facility.
- Close coordination needs to be maintained with the facility management during the various stages of subproject implementation.
- All contractor work and workers' access need to be authorized by the facilities management.
- Separate access for workers to the work areas shall be provided.
- The contractor work should not be allowed during the schools working hours or the services peak hours of health facilities.
- Importance of providing after sales services and support to the facilities when needed.

Sections 6.1 and 6.2 below include the number of consulted individuals in each facility and annex 6 includes samples of the consultation records.

6.1. Healthcare Facilities Consultation

No	Facility Name	Arabic name	Governorate	Consulted Workers		Consulted Patients / Neighbors		Total Consulted
				M	F	M	F	
1.	Al Rayadah hospital	مستشفى الريده	Hardramout	2	2	2	1	7
2.	Qusayar Health Center	المركز الصحي بقصيعر	Hardramout	2	3	2	-	7
3.	Sina'a Health Center	المركز الصحي صناء - رخيه	Hardramout	4	1	3	-	8
4.	Amd Health Center	مركز عمد الصحي	Hardramout	3	1	2	1	7
5.	Al-Som Hospital	مستشفى السوم	Hardramout	4	1	1	1	7
6.	Al-Huda Health Center	مركز الهدى الصحي	Shabwah	4	2	2	1	9
7.	At-Talh Hospital - Shawah	مستشفى الطلح	Shabwah	5	2	2	-	9
8.	Al-Noqob Health Center	مركز النقوب الصحي	Shabwah	5	2	3	-	10
9.	Ar-Rawdh Hospital	مستشفى الروضه	Shabwah	2	2	2	1	7
10.	Al-Hanak Health Center	مركز الحنك الصحي	Shabwah	3	2	3	-	8
11.	Rodhom Hospital	مستشفى رضوم	Shabwah	5	2	2	1	10
12.	Karawi Health Center	مركز كروي الصحي	Al-Mahrah	4	1	2	-	7
13.	Al-Sultan Qaboos Hospital	مستشفى السلطان قابوس	Al-Mahrah	3	2	1	1	7
14.	Arnabut Health Center	مركز أرنبوت الصحي	Al-Mahrah	2	2	2	1	7
15.	Souq Al-Khamis Health Center	مركز سوق الخميس الصحي	Lahj	8	1	3	-	12
16.	Rosod General Hospital	مستشفى رصد العام	Abyan	4	3	2	1	10
17.	Al-Ayn Health Center	مركز العين الصحي	Taiz	3	2	1	1	7

No	Facility Name	Arabic name	Governorate	Consulted Workers		Consulted Patients / Neighbors		Total Consulted
				M	F	M	F	
18.	Al-Shefa'a Health Unit	وحدة الشفاء	Taiz	3	2	2	1	8
19.	Al Jarahi Old Health Center	مركز الجراحي الصحي	Al-Hudaydah	5	2	2	-	9
20.	Al Madman Health Center	مركز المدمان الصحي	Al-Hudaydah	1	3	1	1	6
21.	Al Hadadiah Health Center	مركز الحدادية الصحي	Al-Hudaydah	4	2	1	2	9
22.	Al Maibaliah Health Center	مركز الميبالية الصحي	Al-Hudaydah	2	3	1	-	6
23.	Al Ribat Health Center	مركز الرباط الصحي	Raymah	3	3	1	-	7
24.	Kosmah Health Center	مركز كسمة الصحي	Raymah	3	4	2	1	10
25.	Al Qusaia Health Center	مركز القصيع الصحي	Raymah	3	2	1	2	8
26.	Al-o'dain General Hospital	مستشفى العدين العام	Ibb	7	6	3	2	18
27.	Ash-Shaheed Hasan Al-Ba'adani Hospital	مستشفى الشهيد حسن البعداني	Ibb	6	2	2	-	10
28.	Manzel Mussa Health Center	مركز منزل موسى الصحي	Ibb	4	1	1	-	6
29.	Hayssan Health Center	مركز حيسان الصحي	Ibb	3	1	2	-	6
30.	Al-Yahari Health Center	مركز اليهاري الصحي	Ibb	2	2	1	2	7
31.	Al-A'thareb Health Center	مركز العذارب الصحي	Ibb	3	1	-	-	4
32.	Al-Dhawher Health Center	مركز الظوهر	Ibb	3	2	-	-	5
33.	Al-Helah Health Center	مركز الحلّه الصحي	Dhamar	2	3	1	-	6
34.	Al-Sanam Health Center	مركز السنام الصحي	Dhamar	3	1	2	-	6
35.	Kherbat Abu Yabis Hospital	مستشفى خربة أبو يابس	Dhamar	5	2	2	1	10
36.	Zoragah Hospital	مستشفى زراجة	Dhamar	5	3	3	1	12
37.	At-Tashleel Health Center	مركز التشليل الصحي	Dhamar	2	3	2	1	8
38.	Ash-Shaheed Omer Ali Hospital	مستشفى الشهيد عمر علي	Al-Baydha	5	2	3	2	12
39.	A'afar-Health Center	مركز عفار الصحي	Al-Baydha	2	3	1	-	6
40.	Eariab-Health Center	مركز عريب الصحي بمكيراس	Al-Baydha	3	2	2	1	8
41.	Qarn Al-Asad-Health Center	مركز قرن الأسد الصحي	Al-Baydha	2	2	1	1	6
42.	Al-Aghmor Health Center	مركز الأغمور الصحي	Sana'a	2	2	-	-	4

No	Facility Name	Arabic name	Governorate	Consulted Workers		Consulted Patients / Neighbors		Total Consulted
				M	F	M	F	
43.	Bani- Asmaial Health Center	مركز بني إسماعيل الصحي	Sana'a	2	2	1	-	5
44.	Qafl Shammar Hospital	مستشفى قفل شمر المحوري	Hajjah	6	2	3	1	12
45.	Al-Tour Hospital	مستشفى الطور	Hajjah	3	2	2	1	8
46.	Aflah Al-Sham Health Center	مركز افلح الشام الصحي	Hajjah	4	2	2	-	8
47.	Al-Hisn Health Center	مركز الحصن الصحي	Al Mahwit	1	2	1	-	4
48.	Al-Nagrah Health Center	مركز النجرة الصحي	Al Mahwit	3	1	-	-	4
Total				**165**	**101**	**81**	**30**	**375**

6.2. Schools Consultation

No	Facility Name	Arabic name	Governorate	Consulted workers		Communities / Neighbors		Total Consulted
				M	F	M	F	
1.	Aisha Complex for Girls	مجمع عائشة للبنات	Hardramout	-	5	-	2	7
2.	Omar bin Abdulaziz School	مدرسة عمر بن عبدالعزيز	Hardramout	2	2	3	-	7
3.	The girls high School Ghail Bawazeer	ثانوية البنات بغيل باوزير	Hardramout	1	4	-	2	7
4.	The girls high School in Qasayaar	ثانوية البنات بقصيعر	Hardramout	1	5	-	1	7
5.	Aydeed School	ثانوية عيديد للبنات	Hardramout	3	3	2	-	8
6.	Al-Sayidah Khadijah School	مدرسة السيدة خديجة القطن	Hardramout	1	3	1	2	7
7.	Bohayrat Al-Sham School	مدرسة بحيرة شبام حضرموت	Hardramout	6	-	-	-	6
8.	Um-Al-Mo'amineen School	مدرسة ام المؤمنين ب عمد	Hardramout	-	4	1	2	7
9.	Ayath School	مدرسة عياذ	Shabwah	2	3	1	1	7
10.	Al-Thawra School - Habban	مدرسة الثورة ب حبان	Shabwah	3	2	3	-	8
11.	Az-Zahrah School - Khorah	مدرسة الزهراء ب خوره	Shabwah	4	2	3	1	10
12.	Kerathah School	مدرسة كراثه	Shabwah	3	-	2	-	5
13.	Al-Sadiyah School	مدرسة السدية	Shabwah	2	3	2	1	8

No	Facility Name	Arabic name	Governorate	Consulted workers		Communities / Neighbors		Total Consulted
				M	F	M	F	
14.	Albaihani School	مدرسة البيحاني	Shabwah	3	1	2	-	6
15.	Belqees School	مدرسة بلقيس	Shabwah	2	3	1	1	7
16.	Al Mensaf School	مدرسة المنصاف	Al-Mahrah	-	5	-	2	7
17.	Al Zahrah School	مدرسة الزهراء	Al-Mahrah	-	7	-	-	7
18.	Khawalah School	مدرسة خولة	Al-Mahrah	1	4	1	1	7
19.	Radfan School	مدرسة ردفان	Al-Mahrah	3	2	2	-	7
20.	Saeed Naseeb School	مدرسة سعيد نصيب	Al-Mahrah	3	1	2	-	6
21.	Al-Qaiti School	مدرسة القعيطي	Lahj	5	2	2	1	10
22.	Ash-Shaheed Said Abdulmuhsen School	مدرسة الشهيد سعيد عبد الرحمن	Lahj	3	2	3	1	9
23.	Mojama'a Al-Saeed School	مجمع السعيد للبنات	Lahj	2	6	-	2	10
24.	Al-Khansa School	مدرسة الخنساء للبنات	Lahj	1	6	1	2	10
25.	Mojama'a Ash-Shaheed Al-Awdi	مجمع الشهيد العودي	Lahj	4	2	3	-	9
26.	Khawlah Bint Al-Azwar School	مدرسة خولة بنت الأزور	Aden	-	9	1	2	12
27.	Abu Harb School	مدرسة أبو حربه	Aden	2	2	3	-	7
28.	Asma Bint Abu Baker School	مدرسة أسماء بنت أبي بكر	Aden	2	3	1	1	7
29.	Ba-Theb School	مدرسة باذيب	Aden	4	2	3	-	9
30.	Mojamma Al-Mehdhar (Ali Salem Baraba'a)	مجمع المحضار (سالم علي بارباع)	Aden	3	3	3	1	10
31.	Al-Mmdarah Girl School	مدرسة الممدارة بنات	Aden	2	3	1	1	7
32.	Ali Mohammed Saleh School	مدرسة علي محمد صالح	Ad-Dhale'e	4	3	1	1	9
33.	Abdullah Hamoud Al-Samni School	مدرسة عبدالله حمود السنمي	Ad-Dhale'e	4	3	2	-	9
34.	Abdullah Abduldaim School	مدرسة عبداللة عبدالدايم	Ad-Dhale'e	6	1	2	-	9
35.	Abdullah Abdulkareem School	مدرسة عبدالله عبدالكريم	Ad-Dhale'e	2	3	2	2	9
36.	Oqbah Bin Nafe'a School	مدرسة عقبة بن نافع	Ad-Dhale'e	3	3	2	1	9
37.	Mudiyah Girl School	ثانوية موديه البنات	Abyan	1	4	1	2	8
38.	Al-Faqeed Alalah School	الفقيد علعلة	Abyan	5	3	1	1	10

No	Facility Name	Arabic name	Governorate	Consulted workers		Communities / Neighbors		Total Consulted
				M	F	M	F	
39.	Abdullalah Shaikh School	مدرسة عبد الله شيخ	Abyan	5	2	2	-	9
40.	Omer Bin Abdulaziz School	مدرسة عمر بن عبدالعزيز	Taiz	4	2	1	1	8
41.	Ash-Shaheed Abdu Qasem School	مدرسة الشهيد عبده قاسم	Taiz	4	2	1	-	7
Total				**106**	**125**	**62**	**35**	**328**

Annex 1 Subproject Environmental and Social Screening Form

Subproject name	Supply and Installation of Solar Power Systems to 89 Facilities
Subproject location	48 Healthcare facilities and 41 schools located in 71 rural and peri-urban districts across 16 governorates
Subproject Risk Level	Moderate
Was the site visited beforehand	Yes
Estimated Start/Completion Date	1 June 2023 to 31 October 2023
Observations/Comments	Indicated in the conclusion below
ESSO Name	Ayad Omar
Project Manager Name	Ziad Jaber

Questions	Answer		Due Diligence / Action
	Yes	No	
Is the subproject likely to generate large to medium scale adverse risks and impacts on human populations or the environment?		X	An ESIA and ESMP must be prepared
What is the nature of these risks and impacts and what standards must an ESIA and ESMP would have to take into account	NA		
Does the subproject involve civil works including the rehabilitation of buildings?		X	
Is the subproject located in the vicinity of any known cultural heritage sites?		X	
Does the subproject have adverse risks and impacts on human populations or the environment that are not likely to be significant, do not involve activities that have a high potential for harming people or the environment, and are located away from environmentally or socially sensitive areas.	X		A proportionate ESMP must be prepared
Does the subproject have potential adverse risks to and impacts on human populations or the environment that are likely to be minimal or negligible?	X		The SEP, LMP, and the GBV SEA/SH Prevention and Response Plan

Conclusion

- ***Minor work will be implemented within the existing facilities.***
- ***Estimated risk associated with the subproject implementation is moderate.***
- ***The ESMP preparation is required for the subproject. Project SEP, LMP, FLAP, GBV/SEA/SH Action plan are applicable on this intervention.***

Annex 2 Design Requirements and Guidelines

The UNOPS will carry out the detailed design works for the PV solar system as per the following

requirements:

- **Technical Assessment Report**: Preparation of the technical assessment report should be in consultation with stakeholders and should serve to identify user needs, requirements, and quality expectations. Relevant codes, standards, and minimum requirements must be clearly identified, and all site surveys, structural integrity check, testing the existing network and wiring and collection of additional data as necessary, environmental and risk assessments should be also considered in preparation of the technical assessment report. This report should include the following information for the facility:
    1. Site information based on site investigations and surveys, which should include but not limited to:
        a. As built schematic diagram for the Main Distribution board and its location within the facility.
        b. As built drawing for the top roof where the PV system is proposed to be installed, includes area, existing utilities, etc.
        c. Structural integrity checks for the top roof.
        d. Verification of the total connected load for each facility.
    2. Proposed codes and standards to be used in the design. Any other national or international requirements.

Detailed Design

Include the following:

1. PV System layouts and drawings including Single Line Diagram (SLD), Cable routing layout for DC & AC, earthing system, and Junction Box(s) and combiner box(s).
2. Cable selection schedule and voltage drop calculations.
3. Mounting Structure system (layout, fixation, and analysis).
4. Structural calculation report for the design of the mounting structure.
5. Schematic diagram for the proposed new Main Distribution Board (MDB).
6. Outdoor LED Lighting fixtures layout.

Design Guidelines:

Design Parameters and Assumptions

The following parameters and inputs will be considered for system sizing and design:

- Average solar irradiance will be considered in the design which is 5.5 [kWh/m^2/day]
- Total system loss caused by temperature, azimuth (system orientation), dust, inverter inefficiency, cable loss is considered to be 40 %
- The design system voltage shall be 48 VDC (for the battery bank);
- 0.5 autonomy days for the battery bank sizing;
- 50 % depth of discharge for the battery bank;
- Battery round trip efficiency (RTE) is 85 %;
- Standard maintenance free VRLA batteries will be used in the project GEL type, no more than four (04) strings shall be paralleled;
- The maximum power for the inverter sizing will be considered as follow in table
- MPPT charge controllers (CC) will be used in the project as they have a higher efficiency than standard PWM CC and it allow more flexibility in the design and selection

Technical Specifications.

PV Modules

- The PV array(s) should be constructed with the minimum shading effect;
- It should be comprising of either mono-crystalline or polycrystalline;
- Module capacity with minimum 500 Wp.
- The module type must conform with CE and IEC 61215, IEC 61730, IEC 61701 or equivalent standards;
- Module conversion efficiency should be equal to or greater than 19.5 % under STC;

- The PV manufacturer should be approved as tier-1;
- The PV module shall perform satisfactorily in humidity up to 100% with temperature between – 40 ^{o}C to +85 Co;
- The rated output power of any supplied module shall have tolerance of 0-5 W;
- The module shall be provided with a junction box with IP67;
- The supplied module DC voltage should be not less than 600 VDC;
- The modules shall have individual serial numbers in addition to nameplate;
- The product warranty should be at least 10 years.

Mounting Structure

- Structural material shall be corrosion resistant and electrolytic compatible with the materials used in the module frame;
- Fasteners, nuts and bolts should be made of stainless steel, while all clamps used shall be earthing clamps;
- Galvanizing should meet ASTM A-123 hot dipped galvanizing or equivalent if steel frame is used, Aluminum frame structure with adequate strength can also be used;
- Structure shall be supplied complete with all required accessories to be compatible for allowing easy installation at the rooftop site;
- The structures shall be designed to allow easy replacement of any module;
- The structure shall be designed for simple electrical installation; therefore, onsite welding will not be acceptable at any point;
- Detailed drawings and calculations shall be provided prior to material supply and fabrication for UNOPS approval, such drawings shall include, but not limited to:
    - Determination of true south at the site;
    - Array tilt angle with permitted tolerance;
    - Details with drawings for fixing the modules;
    - Structure installation details and drawings;
    - Electrical grounding (earthling);
    - Safety precautions to be taken.
- The system workshop warranty should be at least 5 years.

Solar Inverter/Charger

- The off-grid inverter shall produce pure sine wave form with provision for battery charger, and it can be configured individually or in parallel;
- Output voltage shall be single phase, 230 V ac $\pm$10 %;
- Output frequency shall be 50 Hz;
- Total Harmonic Distortion shall be less than 3%;
- Designed for indoor enclosure IP 20;
- Maximum efficiency should be not less than 94 % at full load;
- Inverters to be certified to meet at least CE and UL marking and compliant with IEC 62109;
- The device should be integrated with LED indicators and LCD display;
- The device shall be mounted to a non-flammable support (wall) designed to the inverter load;
- The inverter shall include low voltage disconnect feature;
- The inverter/ charger shall allow adjustment of battery voltage and charging current;
- The inverter shall be vertically mounted, the electrical connections and cable glands shall be oriented down;
- The inverter/ charger must not be situated directly above the battery or in a cabinet with it;
- The device shall allow connection to grid and/or backup generator(s);
- The charging function of the inverter/charger shall include battery charging functionality;
- Protections required: AC overload and load short circuit, overvoltage, overheating and battery reverse polarity;
- The inverter shall allow internet connection for remote monitoring;

- Cable to each inverter shall be protected by a fusible disconnect or circuit breaker;
- Product warranty shall be 5 years.

Storage Battery(s)

- Batteries shall be Gel type OPzV 2V cell, the rating shall be calculated @ 10 Hr discharge rate;
- Battery cyclic life shall be at least 2500 cycles at 50% depth of discharge (DOD), batteries shall be tested in accordance with IEC 61427 standard;
- Reliable performance at high operating temperatures of up to 50° C;
- The battery bank shall consist of no more than 3 strings in parallel;
- Battery bank voltage shall be 48 volts;
- Wires connected to batteries shall utilize appropriately sized and rated lugs or terminals and proper hardware; batteries shall be installed in a secured, well-ventilated powerhouse, or in an outdoor rated enclosure.
- One brand can be used for the entire project;
- The operating temperature for the battery shall be -20°C to +55 °C;
- Product warranty shall be 2 years; warranty certificates shall be provided by the manufacturer.

Charge Controller

- Maximum Power Point Tracking (MPPT) type;
- PV charging efficiency at least 92%;
- Controller must utilize passive cooling (not fans);
- Should allow parallel operation, i.e., more than one unit can be connected in parallel;
- Controllers to be certified to meet at least one of the following standards: CE or UL 1741 Marking, IEC 62509 or IEC 62093;
- The device should have LED or LCD display;
- Product warranty shall be 5 years.

DC Junction Box

- The DC junction box to be provided for termination of connecting cables. The DCJB shall be made of metal and suitable for outdoor installation;
- All wires/cables must be terminated through cable lugs;
- DC breakers and fuses shall be used, 2 spare inputs shall be considered and built in SPD.

Data Logging and Monitoring System

- The contractor shall provide necessary hardware and software to measure and/or record energy parameters such as output voltage, consumed current, output frequency, power and energy);
- Could be either built in or external device;
- The system should be capable to operate through GSM, contractor should provide all accessories needed such as sim card and modules;
- The main function of such a system is to monitor and record energy data and system parameters on a predetermined interval basis. Such data can be accessed remotely; the contractor should provide a required interface to the plant to access such data.

Cables and Wires

- All cables shall be marked properly according to approved design so that cable can be easily traced and identified;
- All outdoor exposed wiring to be protected from UV radiation and physical damage, all cabling above ground should be suitably mounted inside cable trays with proper covers, while underground cables should be housed inside PVC conduit with 50 % clearance;
- DC cable: Should be TUV certified with double insulating material and jacket, made of copper, stranded type, the insulation is also flame retardant;
- PV array to battery circuit(s) to be sized for maximum 3% voltage drop at rated array power (Imp);
- AC cable: Armored cables in conduit shall be used for underground installations, while XLPE cables shall be used for indoor for indoor/outdoor installation;
- AC cables shall be sized for maximum 3% voltage drop at maximum load;

- Cable ends connections are to be made through suitable lugs or terminals, crimped properly and with use of cable glands.

Battery Box

- The battery box should be made of powder coated steel;
- Suitable for outdoor installation with IP 65;
- Constructed with a lockable front door;
- Passive cooling ventilation.

Distribution enclosure with MCB breakers

- The distribution board should allow flexibility to connect MCCB, MCB, RCCB, RCD or direct cable;
- Internal connection should be through busbars, the busbar rating should be at least 200 A;
- Single phase, 220 V;
- Ingress protection must be at least IP41;
- Enclosure material should be galvanized steel sheets;
- Fault level: at least 35 kA;
- Minimum Number of ways is 24;
- Main breaker rating is 63 A for schools and 100 A for health centers, the main breaker should be RCBO type;
- The sub breakers rating should be as follows: 18 X 16 A MCB type, 4 X 40 A MCB type;
- High quality breakers
- Warranty: at least two years.

LED Light

- LED type: Bulb LED light;
- Power: 12 W;
- Lamp luminous efficacy: not less than 90 lm/W;
- Cap type & base: bayonet bulbs- B22d-BC/ E27;
- Color temperatures (CCT): 5000 K to 6500 K;
- Input Voltage and frequency: 220V, 50 Hz;
- Working Lifetime (Hour): at least 10,000 h;
- Operation temperature rang: up to 50°C;
- Certification: All related certificates shall be provided such CE, RoHS;
- Warranty: at least two years.

LED Outdoor Light

- LED outdoor light shall withstand all the weather and working conditions and corrosive environment;
- LED light 30 W outdoor light;
- Lamp luminous efficacy: not less than 100 Im/w;
- Voltage rating: 220 VAC, ±15%, 50 Hz ±2%;
- Working life time: not less than 30,000;
- The color temperature range: 5000K – 6500K;
- The LED lamps outdoor designed with IP 65 protection;
- Operating Temperature range: up to 60°C;
- Certification: All related certificates shall be provided such CE, RoHS;
- Wall Mounted type;
- Warranty: at least two years.

Fire Extinguisher

- A portable fire extinguisher shall be provided, (2 extinguishers for the health facility) should be supplied one to be located near to the battery box and the other one located near the inverter unit;
- Powder extinguishers; 6 kg capacity;
- Made of high strength steel cylinders with a red epoxy polyester paint finish.

Earthing and Lightning System

- Each array structure of the PV modules should be grounded properly;

- lighting arrester should be provided;
- All metal casing/shielding of the system and its components should be thoroughly grounded;
- Earth resistance should be tested in presence of the UNOPS representative by a calibrated earth tester, the earth resistance should not be more than 5 Ohm.
- Earthing installation in accordance with the IEE Wiring regulations, BS 7671
- All conductive materials shall be copper.
- The size of conductor shall be according to table 54.7 of IEE – BS 7671 – IEC 60365-5-54.

System Commissioning

- The contractor shall provide a time plan and test procedure for the process of commissioning;
- The contractor shall prepare a commissioning report and carry out all needed test procedures of commissioning. The commissioning process should be witnessed and approved by UNOPS;
- Such testing should include the following tests as minimum:
  - Cable insulation and continuity test: such tests should be carried before commending installation;
  - System earthing test;
  - Battery testing which includes the following:
  - Ensure that batteries are fully charged by measuring the terminal voltage, if not batteries should be charged before carrying out testing and commissioning;
  - Battery Inspection and Cleaning: A visual inspection should be done to assess the general condition of the system's batteries. Check for any electrolyte leak, cracks in the batteries, or corrosion at the terminals or connectors;
  - Terminals and connections: ensure that all terminals and connections are tight and make sure that the same cross section is used for jumpers, measure the negative and positive pole cable length to ensure that it's equal.
  - Module testing which includes the following:
  - Checking the cleanness of surface (glass) area of the module as it should be free of any dirt and dust;
  - PV modules Visual Inspection: A visual inspection of the modules should be done to check for defects in the modules such as cracks, chips, delamination, fogged glazing, and discoloration, this should be done for the front glass and back sheet;
  - PV modules connector and cable Inspection: Check the sealing gels of the junction box to ensure it have no crack or crevice;
  - Ensure that all modules have been tested before shipping by double checking the flash reports;
  - DC voltage measurement: This can be done either on the modules level or on combiner box level;
  - Inverter and Charge Controller
    - Ensuring that all components are free of dust, if not, a dry cloth should be used to wipe away any accumulated dirt/dust;
    - A visual inspection should be done to ensure that all the indicators such as LED lights are working and a check on the tightening of the bolts both DC and AC;
    - Charging: The charge controller should indicate that the system is charging when the sun is up, the charging current should be measured for each string/ array;
    - If such measurement were taken at noon time, the charging current should be close to the maximum current;
    - Discharging: checking that the battery is discharging when connected to the load;
    - Inverter: Checking the voltage and current in the inverter, measuring the output voltage and frequency;

- Wiring, Connections and Electrical Panels: Wiring installations should be checked for any cracks, breaks or deterioration in the insulation/conduits, inspect connections for any corrosion and/or burning. Switches should not spark when turned on or off;
- Combiner Boxes and fuses Box: must check strings fuses using a multimeter (continuity test on each fuse) to insure no blown fuse exist, check the tightening of the bolts of the fuse holders should be checked as per manufacturer manual, visual check of the cables and fuse holders;
- AC Panels: After switching off loads and inverters, check the functionality of the RCDs and RCBOs by bushing test button and noticing the breaker open, check the tightening of all cables bolts as per manufacturer manual, visual check of all cables and breakers;

System Warranty, after Sales Services

- Bidders shall include in their offers system maintenance for 1 year, bidders shall provide necessary equipment and components to run the system safely;
- Bidders shall also carry out periodic preventive maintenance visits at least one visit each 3 months, the scope and nature of such visits shall be consulted and agreed with UNOPS engineers, bidders are entitled to provide a signed checklist by the end-user.
  The preventive maintenance shall but it shall include the following as minimum:
  - Battery System: A visual inspection should be done to assess the general condition of the system's batteries. Check for any electrolyte leak, cracks in the batteries, or corrosion at the terminals or connectors. Ensure that all terminal and connections are tight;
  - PV Modules: Checking the cleanliness of the surface (glass) area of the module. A visual inspection of the modules should be done to check for defects such as cracks, chips, delamination, fogged glazing, and discoloration. Check the sealing gels of the junction box to ensure it have no crack or crevice;
  - DC voltage measurement: This can be done either on the modules level or on combiner box level.
  - Charge Controller/ Inverter: Ensuring that all components are free of dust, if not, a dry cloth should be used to wipe away any accumulated dirt/dust; A visual inspection should be done to ensure that all the indicators such as LED lights are working and a check on the tightening of the bolts both DC and AC;
  - Electrical Panels: Wiring installations should be checked for any cracks, breaks or deterioration in the insulation/conduits, inspect connections for any corrosion and/or burning. Switches should not spark when turned on or off;
  - Combiner Boxes and fuses Box: must check strings fuses using a multimeter (continuity test on each fuse) to insure no blown fuse exist, check the tightening of the bolts of the fuse holders should be checked as per manufacturer manual, visual check of the cables and fuse holders;
  - AC Panels: After switching off loads and inverters, check the functionality of the RCDs and RCBOs by bushing the test button and noticing the breaker open, check the tightening of all cable bolts as per manufacturer manual, visual check of all cables and breakers.

- The bidder shall assign a service technical personnel (local focal point) to provide satisfactory and uninterrupted services during the maintenance period, bidder shall respond within 2 days from the date of the intimation of fault, caring out system maintenance and troubleshooting, carrying out preventive maintenance protocols and procedures, update the system software and interface when needed, and keep records and activities log.

- It's the bidder sole responsibility to establish sufficient inventory of spare parts to run the system without interruption during maintenance period;

- The bidder shall provide necessary labels highlighting warranty details and phone numbers to call in case of problems.

Final Completion

- The contractor shall complete any required document or list, clean up the construction site and remove any temporary structures, equipment or services, and construction debris;
- Copies of all final approvals and certifications shall be provided to UNOPS.
- The contractor shall provide three (3) hard copy sets and one soft copy of the final Project as-built documentation.

Annex 3 Solar PV Systems (Code of Practice)

Installation

The contractor shall:

- Ensure that solar PV systems are installed by qualified and experienced trades people, in order to avoid or minimize electrocution and other health and safety issues associated with working with hazardous materials

Life and Fire Safety

The Contractor shall install life and fire safety measures as instructed by UNOPS

Beneficiary and User Awareness

The Contractor shall build awareness and provide training to beneficiaries and users of facilities with the aim of improving their understanding of the environmental and health issues associated with the battery life cycle, including end-of-life management; most particularly:

- The safe handling of batteries including installation, removal, transport, storage and disposal
- The environmental and health aspects of poor battery disposal
- Information on the environmental and health issues associated with the highly toxic content of batteries and explanation as to why they must be stored, transported and disposed of in specific ways

Safe Handling of Batteries

The Contractor shall train beneficiaries on the following measures before they handle batteries:

- Prohibit unauthorized access to battery areas
- Consult battery owners' manuals for instructions on battery handling and hazard identification
- Wear personal protective equipment (PPE) such as chemical splash goggles and a face shield
- Wear acid-resistant equipment such as gauntlet style gloves, an apron, and boots
- Do not tuck pant legs into boots because spilled acid can pool in the bottom of your boots and burn your feet
- Place protective rubber boots on battery cable connections to prevent sparking on impact if a tool does accidentally hit a terminal
- Ensure that all metal tools (spanners, socket wrench drivers, etc.) that will come in contact with the battery terminals have metal handles taped with electrical tape or are protected by other means to help prevent inadvertent short circuits
- Clean the battery terminals with a plastic brush because wire brushes can create static and sparks
- Cover maintenance tools with several layers of electrical tape to avoid sparking
- Replace batteries with a new one if they show signs of damage to the terminals, case or cover

Chemical Hazards

Lead Acid: Sulfuric acid (electrolyte) in lead-acid batteries[25] is highly corrosive and acid exposure can lead to skin irritation, eye damage, respiratory irritation, and tooth enamel erosion. The Contractor shall train beneficiaries to follow the following measures to minimize risk:

- Never lean over a battery while boosting, testing or charging it
- If acid splashes on your skin or eyes, immediately flood the area with cool running water for at least 15 minutes and seek medical attention immediately

[25] UNOPS will use gel lead-acid batteries, which are significantly safer than traditional lead-acid batteries, because they are sealed in a plastic encasement with a valve that removes excess pressure.

- Always practice good hygiene and wash your hands after handling a battery and before eating
- Wash your hands properly if you handle the lead plates in a battery to avoid exposure to lead. Signs of lead exposure include mood swings, loss of appetite, abdominal pain, difficulty sleeping, fatigue, headaches and loss of motor coordination.
- The chemical reaction by-products from a battery include oxygen and hydrogen gas. These can be explosive at high levels. Overcharging batteries can also create flammable gasses. For this reason, it is very important to store and maintain batteries in a well-ventilated work area away from all ignition sources and incompatible materials. Cigarettes, flames or sparks could cause a battery to explode.
- Disconnect the battery cables before working on a battery. Be careful with flammable fluids when working on a battery-powered system. The electrical voltage created by batteries can ignite flammable materials and cause severe burns. Workers have been injured and killed when loose or sparking battery connections ignited gasoline and solvent fumes during system maintenance.
- Before making wiring changes to the system, disconnect the battery, either through opening the circuit breaker or over-current device, or by disconnecting the cables. Adding distilled water or cleaning terminals can be done without disconnecting.

Safe Movement of Batteries

The Contractor shall inform beneficiaries of the following measures regarding the safe movement of batteries:

- Lifting and moving batteries must be undertaken with care to avoid personal and environmental harm
- Proper lifting techniques must be used to avoid back injuries
- Because battery casings can be brittle and break easily, they must be handled carefully to avoid an acid spill
- Batteries must be properly secured and upright when handled or transported in a vehicle

Management and Disposal of Used Batteries

The Contractor shall prepare and submit to UNOPS a Battery Management Plan that details how batteries will be collected, transported, stored, recycled or disposed of. More specifically the Battery Management Plan shall:

- Define arrangements made with after sales service centers for the maintenance and reconditioning of batteries
- Identify centers or dealers authorized by local authorities to safely collect, store, transport and re export used and end-of-life batteries from beneficiary facilities.
- Ensure that these centers or dealers implement the relevant Project ESHS requirements, including the use of PPE, the use of proper drums for storing acid, the containment of spills during battery maintenance and collection, and adequate ventilation
- Outline how the contractor will include the end-user in the reverse-supply-chain management through training.

Annex 4 Forced Labor Declaration Form

Part 1 - Forced Labor Performance Declaration

[The following table shall be filled in by the Bidder, each member of a Joint Venture, each Subcontractor/ supplier/ manufacturer providing solar panels and/or solar panel components proposed by the Bidder]

Bidder's Name: *[insert full name]*
Date: *[insert day, month, year]*
Joint Venture Member's or Subcontractor's/supplier's/manufacturer's Name: *[insert full name]*
RFB No. and title: *[insert RFB number and title]*
Page *[insert page number]* of *[insert total number]* pages

Forced Labor Performance Declaration Evaluation and Qualification Criteria
We: □ (a) have not been suspended or terminated, and/or other contractual remedies applied including calling of performance security by an employer, for reasons of breach of forced labor obligations in the past five years. *[if (a) is declared, state N/A for (b) below]* □ (b) have been suspended or terminated, and/or other contractual remedies applied including calling of performance security by an employer, for reasons of breach of forced labor obligations in the past five years. Details are provided below:

Year	Contract identification calling	Name of Employer	Reasons for suspension or, termination, and/or other contractual remedies applied including performance security
-	-	-	-

□ (c) [*If (b) above is applicable, attach evidence demonstrating that adequate capacity and commitment to comply with Forced Labor obligations.]*

We declare that all the information and statements made in this Form are true, and we accept that any misrepresentation contained in this Form may lead to our disqualification by the Employer and/or sanctions by the UNOPS.

Name of the Bidder/ JV member/ Subcontractor/ supplier/ manufacturer _____

Name of the person duly authorized to sign on behalf of the Bidder/ JV member/ Subcontractor/ supplier/manufacturer _____

Title of the person signing on behalf of the Bidder/ JV member/ Subcontractor/ supplier/ manufacturer_____

Signature of the person named above_____

Date signed _____ day of _____, _____

Countersignature of authorized representative of the Bidder (for forms submitted by a JV member, Subcontractor/ supplier/ manufacturer):

Signature: _____

Date signed _____ day of _____, _____

Part 2 - Forced Labor Declaration

Date: _____ RFB No.: _____

Alternative No.: _____

Contract Title:

_____

To:

We, the undersigned, declare that, if awarded the Contract, we, including our Subcontractors and suppliers/ manufacturers, are required to comply with the contractual Forced Labor obligations. In this regard, we:

(a) accept that there will be no Forced Labor among the staff, employees, workers and any other persons employed or engaged by us;

(b) accept that staff, employees, workers and any other persons employed or engaged, will be hired under employment conditions that meet the contractual obligations set out in the Contract;

(c) will include in our contracts with Subcontractors/ suppliers/ manufacturers of *[solar panels] [solar panel components]* obligations to prevent Forced Labor among the staff, employees, workers and any other person employed or engaged by the Subcontractor/ supplier/ manufacturer;

(d) will include in our contracts with Subcontractors/ suppliers/ manufacturers of *[solar panels] [solar panel components]*, that the Subcontractors/ suppliers/ manufacturers include an obligation to prevent Forced Labor in all contracts that they execute with their suppliers/ manufacturers of [solar panel][solar panel components];

(e) will monitor our Subcontractors/ suppliers/ manufacturers of *[solar panels][solar panel components]* on implementation of obligations to prevent Forced Labor among the staff, employees, workers and any other person employed or engaged by them;

(f) will require our Subcontractors to monitor their suppliers/ manufacturers of *[solar panels][solar panel components]* on implementation of obligations to prevent Forced Labor among the staff, employees, workers and any other person employed or engaged by them;

(g) will require our Subcontractors/ suppliers/ manufacturers to immediately notify us of any incidents of Forced Labor;

(h) will immediately notify the Employer any incident of Forced labor on the site, or premises of Subcontractors/ suppliers/ manufacturers of *[solar panels] [solar panel components]*;

(i) will include in periodic progress reports submitted in accordance with the contract sufficient details on our, including our Subcontractors/ suppliers/ manufacturers , compliance with Forced Labor obligations; and we

(j) confirm that the Subcontractors/ suppliers/ manufacturers for *[solar panels][solar panel components]* for this contract are (or likely to be):

[Provide each firm's name, address, primary contact, e-mail address, and the link to the firm's website]

OR

confirm that you have not yet finalized the Subcontractors/ suppliers/ manufacturers of solar panels/components, but when known the firm/s name(s), address(es), primary contact(s), e-mail address(es) and website link(s) will be provided to the Employer, prior to signing the contract, with documentation demonstrating compliance with forced labor obligations to the Employer for approval].

THEN

If (c) above is applicable, attach evidence of how these contract obligations are/will be made.

If (d) above is applicable, attach evidence of how these contract obligations are/will be made.

If (e) above is applicable, please attach evidence of how this monitoring/due diligence is/will be undertaken (such as your inspection protocols, use of inspection agents, frequency of inspections, examples of previous factory/labor inspection reports etc.).

If (f) above is applicable, please attach evidence of how this monitoring/due diligence is/will be undertaken by Subcontractors (such as their inspection protocols, use of inspection agents, frequency of inspections, examples of previous factory/labor inspection reports etc.).

We declare all the information and statements made in this Form are true, and we accept that any misrepresentation contained in this Form may lead to our disqualification by the Employer and/or sanctions by the UNOPS.

Name of the Bidder***_____**

Name of the person duly authorized to sign the Bid on behalf of the Bidder****_____**

Title of the person signing the Bid_____

Signature of the person named above_____

Date signed _____ day of _____, _____

*****: In the case of the Bid submitted by joint venture specify the name of the Joint Venture as Bidder

******: Person signing the Bid shall have the power of attorney given by the Bidder attached to the Bid

[Note: In case of a Joint Venture, the Forced Labor Declaration must be in the name of all members to the Joint Venture that submits the Bid.]

Annex 5 Personnel Code of Conduct Sample Form

Contractors shall ensure that all employees, including those of subcontractors, are informed about and sign Code of Conduct. Code of Conduct sample is available below in which the contractor shall adopt and include all provisions in their own Code of Conduct:

We the Contractor [enter name of Contractor] have signed a contract with UNOPS for [enter description of the activities]. These activities will be carried out at [enter the Site and other locations where the activities will be carried out]. Our contract requires us to implement measures to address environmental and social risks related to the activities, including the risks of sexual exploitation and assault and gender-based violence.

This Code of Conduct is part of our measures to deal with environmental and social risks related to the activities. It applies to all our staff, including laborers and other employees at all the places where the activities are being carried out. It also applies to the personnel of every subcontractor and any other personnel assisting us in the execution of the activities. All such persons are referred to as "Contractor's Personnel" and are subject to this Code of Conduct.

This Code of Conduct identifies the behavior that we require from all Contractor's Personnel.

Our workplace is an environment where unsafe, offensive, abusive or violent behavior will not be tolerated and where all persons should feel comfortable raising issues or concerns without fear of retaliation.

Required Conduct

Contractor's Personnel shall:

1. carry out his/her duties competently and diligently;
2. comply with this Code of Conduct and all applicable laws, regulations and other requirements, including requirements to protect the health, safety and well-being of other Contractor's Personnel and any other person;
3. maintain a safe working environment including by:
4. ensuring that workplaces, machinery, equipment and processes under each person's control are safe and without risk to health;
5. wearing required personal protective equipment;
6. using appropriate measures relating to chemical, physical and biological substances and agents;
7. following applicable emergency operating procedures.
8. report work situations that he/she believes are not safe or healthy and remove himself/herself from a work situation which he/she reasonably believes presents an imminent and serious danger to his/her life or health;
9. treat other people with respect, and not discriminate against specific groups such as women, people with disabilities, migrant workers or children;
10. not engage in any form of sexual harassment including unwelcome sexual advances, requests for sexual favors, and other unwanted verbal or physical conduct of a sexual nature with other Contractor's or Employer's Personnel;
11. not engage in Sexual Exploitation, which means any actual or attempted abuse of position of vulnerability, differential power or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another. In Bank financed projects, sexual exploitation occurs when access to or benefit from Bank financed Goods, Works, Consulting or Non-consulting services is used to extract sexual gain;

12. not engage in Sexual Assault, which means sexual activity with another person who does not consent. It is a violation of bodily integrity and sexual autonomy and is broader than narrower conceptions of "rape", especially because (a) it may be committed by other means than force or violence, and (b) it does not necessarily entail penetration.
13. not engage in any form of sexual activity with individuals under the age of 18, except in case of pre-existing marriage;
14. complete relevant training courses that will be provided related to the environmental and social aspects of the Contract, including on health and safety matters, and Sexual Exploitation and Assault (SEA);
15. report violations of this Code of Conduct; and
16. Not retaliate against any person who reports violations of this Code of Conduct, whether to us or the Employer, or who makes use of the Grievance mechanism for Contractor's Personnel or the project's Grievance Mechanism.

Raising Concerns

If any person observes behavior that he/she believes may represent a violation of this Code of Conduct, or that otherwise concerns him/her, he/she should raise the issue promptly. This can be done in either of the following ways:

1. Contacting the Individual designated by the Contractor [enter name of Contact)
2. In writing at this address [ ]
3. By telephone at [ ]
4. In person at [ ]
5. Calling [ ] to reach the Contractor's hotline and leave a message (if available)

The person's identity will be kept confidential, unless reporting of allegations is mandated by the country law. Anonymous complaints or allegations may also be submitted and will be given all due and appropriate consideration. We take all reports of possible misconduct and will investigate and take appropriate action. We will provide warm referrals to service providers that may help support the person who experienced the alleged incident, as appropriate.

There will be no retaliation against any person who raises a concern in good faith about any behavior prohibited by this Code of Conduct. Such retaliation would be a violation of this Code of Conduct.

Consequences of Violating the Code of Conduct

Any violation of this Code of Conduct by Contractor's Personnel may result in serious consequences, up to and including termination and possible referral to legal authorities.

For Contractor's Personnel

I have received a copy of this Code of Conduct written in a language that I comprehend. I understand that if I have any questions about this Code of Conduct, I can contact [enter name of Contractor's contact person with relevant experience in handling gender-based violence] requesting an explanation.

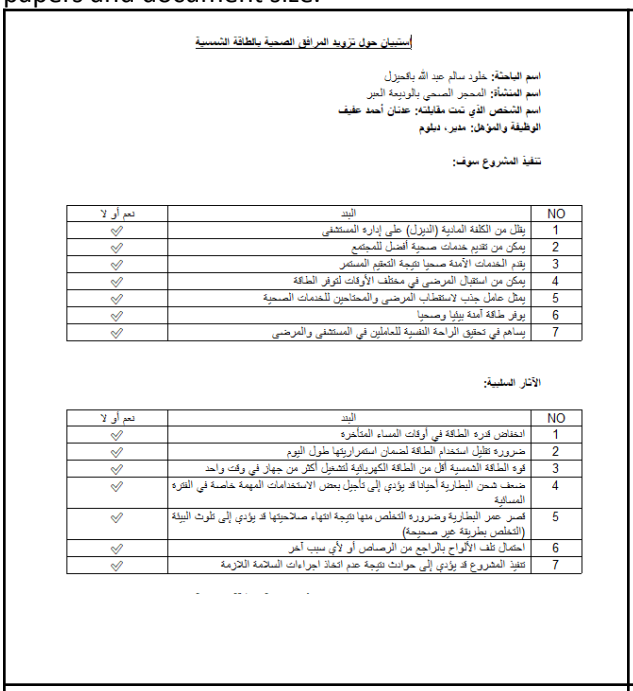
Name of Contractor's Personnel: [insert name]
Signature: _____
Date: (day month year): _____
Countersignature of authorized representative of the Contractor:
Signature: _____

Date: (day month year): _____

A copy of the code shall be displayed in a location easily accessible to the community and affected people. It shall be provided in languages comprehensible to the local community, Contractor's personnel (including subcontractors and day workers), and affected persons.

Annex 6 Consultation Records Samples

Samples only, full list of consultation records is very long and it will significantly increase the number of papers and document size.



إستبيان حول تزويد المرافق الصحية بالطاقة الشمسية

اسم الباحثة: خلود سالم عبد الله بالعيزل
اسم المنشأة: المحجر الصحي بالوديعة الجبر
اسم الشخص الذي تمت مقابلته: عدنان أحمد عفيف
الوظيفة والمؤهل: مدير ، دبلوم

تنفيذ المشروع سوف:

NO	البند	نعم أو لا
1	يقلل من الكلفة المادية (الديزل) على إدارة المستشفى	✓
2	يمكن من تقديم خدمات صحية أفضل للمجتمع	✓
3	يقدم الخدمات الآمنة صحيا نتيجة التعقيم المستمر	✓
4	يمكن من استقبال المرضى في مختلف الأوقات لتوفر الطاقة	✓
5	يمثل عامل جذب لاستقطاب المرضى والمحتاجين للخدمات الصحية	✓
6	يوفر طاقة آمنة بيئيا وصحيا	✓
7	يساهم في تحقيق الراحة النفسية للعاملين في المستشفى والمرضى	✓

الآثار السلبية:

NO	البند	نعم أو لا
1	انخفاض قدرة الطاقة في أوقات المساء المتأخرة	✓
2	ضرورة تقليل استخدام الطاقة لضمان استمراريتها طوال اليوم	✓
3	قوة الطاقة الشمسية اقل من الطاقة الكهربائية لتشغيل أكثر من جهاز في وقت واحد	✓
4	ضعف شحن البطارية أحيانا قد يؤدي إلى تأجيل بعض الاستخدامات المهمة خاصة في الفترة المسائية	✓
5	قصر عمر البطارية وضرورة التخلص منها نتيجة انتهاء صلاحيتها قد يؤدي إلى تلوث البيئة (التخلص بطريقة غير صحيحة)	✓
6	احتمال تلف الألواح بالراجع من الرصاص أو لأي سبب آخر	✓
7	تنفيذ المشروع قد يؤدي إلى حوادث نتيجة عدم اتخاذ اجراءات السلامة اللازمة	✓

استبيان حول تزويد المستشفيات الصحية بالطاقة الشمسية

تاريخ المقابلة :

اسم الباحثة : رشا صالح ربيد

اسم المستشفى : مركز الخراج الجهي / الخراج / الحديدة

اسم الشخص الذي تم مقابلته : عادل محمد واصل (اختياري)

الوظيفة والمؤهل : مدير المركز / بك تربية

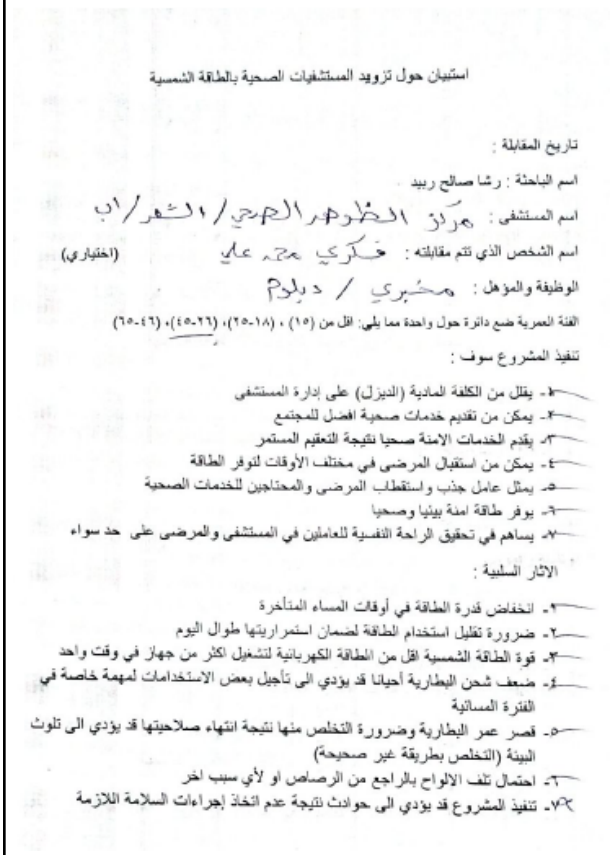
الفئة العمرية ضع دائرة حول واحدة مما يلي: اقل من (١٥) ، (١٨-٢٥)، (٢٦-٤٥)، (٤٦-٦٥)

تنفيذ المشروع سوف :

١- يقلل من الكلفة المادية (الديزل) على إدارة المستشفى
٢- يمكن من تقديم خدمات صحية افضل للمجتمع
٣- يقدم الخدمات الامنة صحيا نتيجة التعقيم المستمر
٤- يمكن من استقبال المرضى في مختلف الأوقات لتوفر الطاقة
٥- يمثل عامل جذب واستقطاب المرضى والمحتاجين للخدمات الصحية
٦- يوفر طاقة امنة بيئيا وصحيا
٧- يساهم في تحقيق الراحة النفسية للعاملين في المستشفى والمرضى على حد سواء

الاثار السلبية :

١- انخفاض قدرة الطاقة في أوقات المساء المتأخرة
٢- ضرورة تقليل استخدام الطاقة لضمان استمراريتها طوال اليوم
٣- قوة الطاقة الشمسية اقل من الطاقة الكهربائية لتشغيل اكثر من جهاز في وقت واحد
٤- ضعف شحن البطارية أحيانا قد يؤدي الى تأجيل بعض الاستخدامات لمهمة خاصة في الفترة المسائية
٥- قصر عمر البطارية وضرورة التخلص منها نتيجة انتهاء صلاحيتها قد يؤدي الى تلوث البيئة (التخلص بطريقة غير صحيحة)
٦- احتمال تلف الالواح بالراجع من الرصاص او لأي سبب اخر
٧- تنفيذ المشروع قد يؤدي الى حوادث نتيجة عدم اتخاذ إجراءات السلامة اللازمة



استبيان حول تزويد المستشفيات الصحية بالطاقة الشمسية

تاريخ المقابلة :

اسم الباحثة : رشا صالح ربيد

اسم المستشفى : مركز الخراج الجهي / الحديدة / الشهر / اب

اسم الشخص الذي تم مقابلته : فكري محمد علي (اختياري)

الوظيفة والمؤهل : محضري / دبلوم

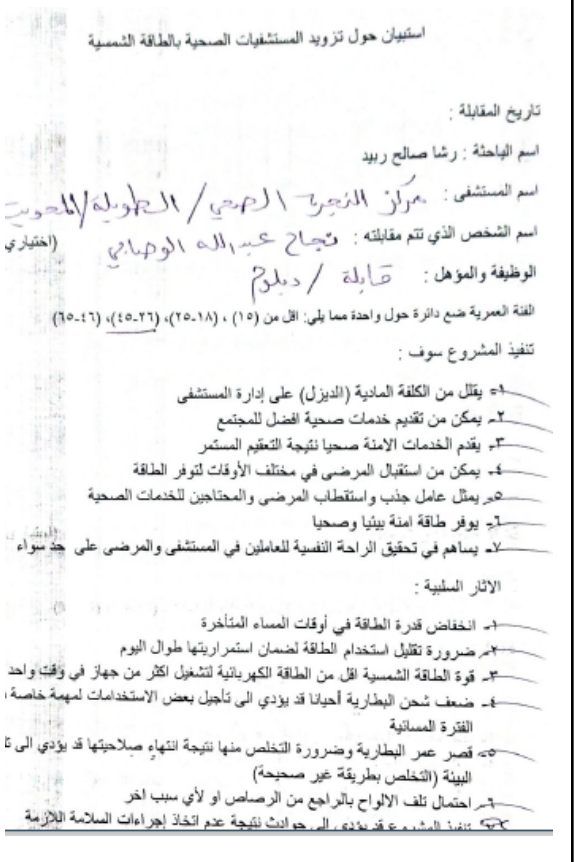
الفئة العمرية ضع دائرة حول واحدة مما يلي: اقل من (١٥) ، (١٨-٢٥)، (٢٦-٤٥)، (٤٦-٦٥)

تنفيذ المشروع سوف :

١- يقلل من الكلفة المادية (الديزل) على إدارة المستشفى
٢- يمكن من تقديم خدمات صحية افضل للمجتمع
٣- يقدم الخدمات الامنة صحيا نتيجة التعقيم المستمر
٤- يمكن من استقبال المرضى في مختلف الأوقات لتوفر الطاقة
٥- يمثل عامل جذب واستقطاب المرضى والمحتاجين للخدمات الصحية
٦- يوفر طاقة امنة بيئيا وصحيا
٧- يساهم في تحقيق الراحة النفسية للعاملين في المستشفى والمرضى على حد سواء

الاثار السلبية :

١- انخفاض قدرة الطاقة في أوقات المساء المتأخرة
٢- ضرورة تقليل استخدام الطاقة لضمان استمراريتها طوال اليوم
٣- قوة الطاقة الشمسية اقل من الطاقة الكهربائية لتشغيل اكثر من جهاز في وقت واحد
٤- ضعف شحن البطارية أحيانا قد يؤدي الى تأجيل بعض الاستخدامات لمهمة خاصة في الفترة المسائية
٥- قصر عمر البطارية وضرورة التخلص منها نتيجة انتهاء صلاحيتها قد يؤدي الى تلوث البيئة (التخلص بطريقة غير صحيحة)
٦- احتمال تلف الالواح بالراجع من الرصاص او لأي سبب اخر
٧- تنفيذ المشروع قد يؤدي الى حوادث نتيجة عدم اتخاذ إجراءات السلامة اللازمة



استبيان حول تزويد المستشفيات الصحية بالطاقة الشمسية

تاريخ المقابلة :

اسم الباحثة : رشا صالح ربيد

اسم المستشفى : مركز الخراج الجهي / الحديدة / الحديدة

اسم الشخص الذي تم مقابلته : نجاح عبدالله الوصابي (اختياري)

الوظيفة والمؤهل : قابلة / دبلوم

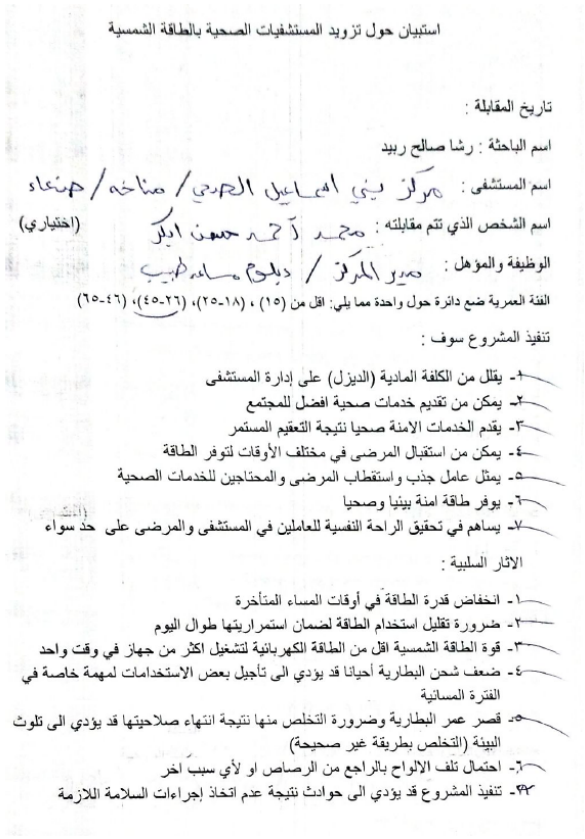
الفئة العمرية ضع دائرة حول واحدة مما يلي: اقل من (١٥) ، (١٨-٢٥)، (٢٦-٤٥)، (٤٦-٦٥)

تنفيذ المشروع سوف :

١- يقلل من الكلفة المادية (الديزل) على إدارة المستشفى
٢- يمكن من تقديم خدمات صحية افضل للمجتمع
٣- يقدم الخدمات الامنة صحيا نتيجة التعقيم المستمر
٤- يمكن من استقبال المرضى في مختلف الأوقات لتوفر الطاقة
٥- يمثل عامل جذب واستقطاب المرضى والمحتاجين للخدمات الصحية
٦- يوفر طاقة امنة بيئيا وصحيا
٧- يساهم في تحقيق الراحة النفسية للعاملين في المستشفى والمرضى على حد سواء

الاثار السلبية :

١- انخفاض قدرة الطاقة في أوقات المساء المتأخرة
٢- ضرورة تقليل استخدام الطاقة لضمان استمراريتها طوال اليوم
٣- قوة الطاقة الشمسية اقل من الطاقة الكهربائية لتشغيل اكثر من جهاز في وقت واحد
٤- ضعف شحن البطارية أحيانا قد يؤدي الى تأجيل بعض الاستخدامات لمهمة خاصة في الفترة المسائية
٥- قصر عمر البطارية وضرورة التخلص منها نتيجة انتهاء صلاحيتها قد يؤدي الى تلوث البيئة (التخلص بطريقة غير صحيحة)
٦- احتمال تلف الالواح بالراجع من الرصاص او لأي سبب اخر
٧- تنفيذ المشروع قد يؤدي الى حوادث نتيجة عدم اتخاذ إجراءات السلامة اللازمة



استبيان حول تزويد المستشفيات الصحية بالطاقة الشمسية

تاريخ المقابلة :

اسم الباحثة : رشا صالح ربيد

اسم المستشفى : مركز بني اسماعيل الحربي/ مناخه/ هنغاء

اسم الشخص الذي تتم مقابلته : محمد أحمد حسن ادلر (اختياري)

الوظيفة والمؤهل : مدير المركز / دبلوم مساعد طب

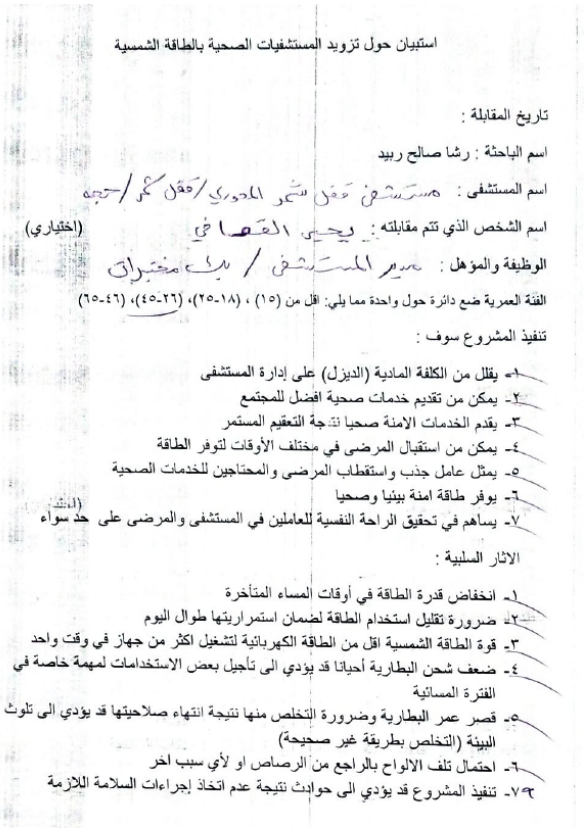
الفئة العمرية ضع دائرة حول واحدة مما يلي: اقل من (١٥) ، (١٨-٢٥)، (٢٦-٤٥)، (٤٦-٦٥)

تنفيذ المشروع سوف :

١- يقلل من الكلفة المادية (الديزل) على إدارة المستشفى
٢- يمكن من تقديم خدمات صحية افضل للمجتمع
٣- يقدم الخدمات الامنة صحيا نتيجة التعقيم المستمر
٤- يمكن من استقبال المرضى في مختلف الأوقات لتوفر الطاقة
٥- يمثل عامل جذب واستقطاب المرضى والمحتاجين للخدمات الصحية
٦- يوفر طاقة امنة بيئيا وصحيا
٧- يساهم في تحقيق الراحة النفسية للعاملين في المستشفى والمرضى على حد سواء

الاثار السلبية :

١- انخفاض قدرة الطاقة في أوقات المساء المتأخرة
٢- ضرورة تقليل استخدام الطاقة لضمان استمراريتها طوال اليوم
٣- قوة الطاقة الشمسية اقل من الطاقة الكهربائية لتشغيل اكثر من جهاز في وقت واحد
٤- ضعف شحن البطارية أحيانا قد يؤدي الى تأجيل بعض الاستخدامات لمهمة خاصة في الفترة المسائية
٥- قصر عمر البطارية وضرورة التخلص منها نتيجة انتهاء صلاحيتها قد يؤدي الى تلوث البيئة (التخلص بطريقة غير صحيحة)
٦- احتمال تلف الالواح بالراجع من الرصاص او لأي سبب اخر
٧- تنفيذ المشروع قد يؤدي الى حوادث نتيجة عدم اتخاذ إجراءات السلامة اللازمة



استبيان حول تزويد المستشفيات الصحية بالطاقة الشمسية

تاريخ المقابلة :

اسم الباحثة : رشا صالح ربيد

اسم المستشفى : مستشفى عفل شمر الحوري/عفل كمر/حجه

اسم الشخص الذي تتم مقابلته : يحيى القصاص (اختياري)

الوظيفة والمؤهل : مدير المستشفى / بك مختبرات

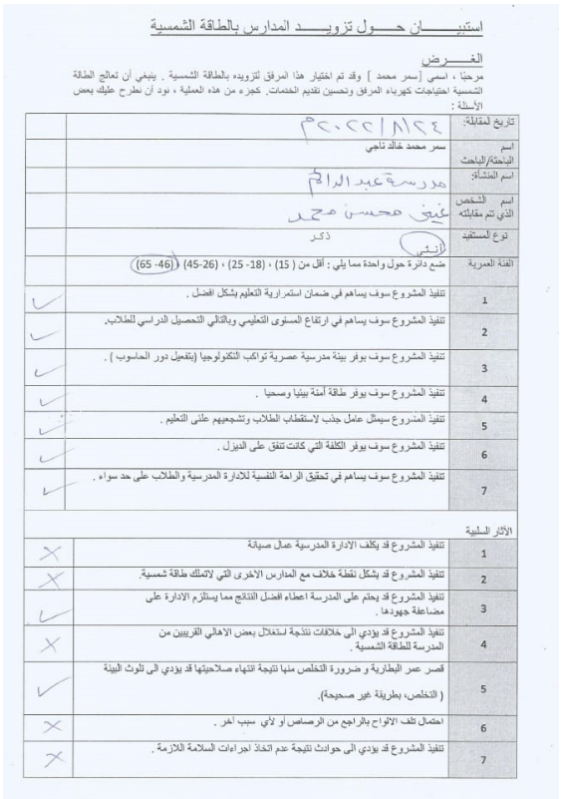
الفئة العمرية ضع دائرة حول واحدة مما يلي: اقل من (١٥) ، (١٨-٢٥)، (٢٦-٤٥)، (٤٦-٦٥)

تنفيذ المشروع سوف :

١- يقلل من الكلفة المادية (الديزل) على إدارة المستشفى
٢- يمكن من تقديم خدمات صحية افضل للمجتمع
٣- يقدم الخدمات الامنة صحيا نتيجة التعقيم المستمر
٤- يمكن من استقبال المرضى في مختلف الأوقات لتوفر الطاقة
٥- يمثل عامل جذب واستقطاب المرضى والمحتاجين للخدمات الصحية
٦- يوفر طاقة امنة بيئيا وصحيا
٧- يساهم في تحقيق الراحة النفسية للعاملين في المستشفى والمرضى على حد سواء

الاثار السلبية :

١- انخفاض قدرة الطاقة في أوقات المساء المتأخرة
٢- ضرورة تقليل استخدام الطاقة لضمان استمراريتها طوال اليوم
٣- قوة الطاقة الشمسية اقل من الطاقة الكهربائية لتشغيل اكثر من جهاز في وقت واحد
٤- ضعف شحن البطارية أحيانا قد يؤدي الى تأجيل بعض الاستخدامات لمهمة خاصة في الفترة المسائية
٥- قصر عمر البطارية وضرورة التخلص منها نتيجة انتهاء صلاحيتها قد يؤدي الى تلوث البيئة (التخلص بطريقة غير صحيحة)
٦- احتمال تلف الالواح بالراجع من الرصاص او لأي سبب اخر
٧- تنفيذ المشروع قد يؤدي الى حوادث نتيجة عدم اتخاذ إجراءات السلامة اللازمة

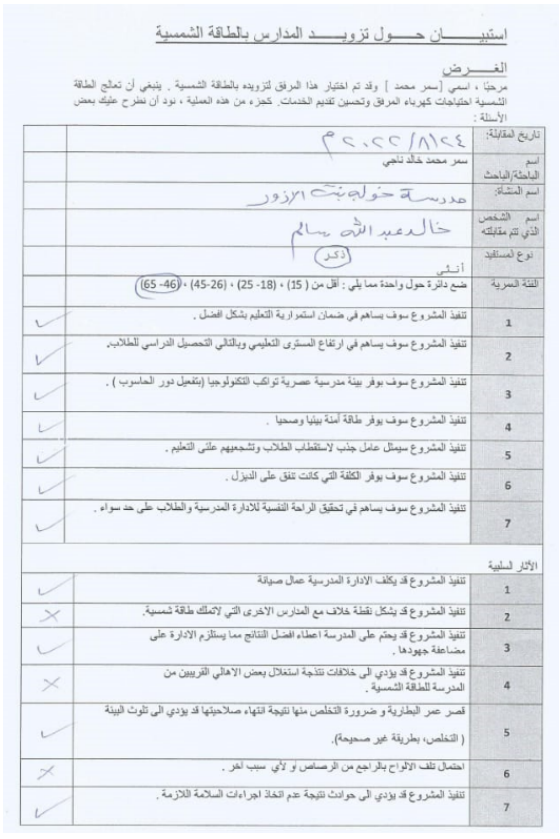


استبيان حول تزويد المدارس بالطاقة الشمسية

الغرض

مرحبا ، اسمي [سمر محمد] وقد تم اختيار هذا المرفق لتزويده بالطاقة الشمسية . ينبغي أن تعالج الطاقة الشمسية احتياجات كهرباء المرفق وتحسين تقديم الخدمات. كجزء من هذه العملية ، نود أن نطرح عليك بعض الأسئلة :

تاريخ المقابلة:	٢٠٢٢/٨/٢٤م
اسم الباحثة/الباحث	سمر محمد خالد ناجي
اسم المنشأة:	مدرسة عبد الرائم
اسم الشخص الذي تتم مقابلته	علي محسن محمد
نوع المستفيد	ذكر (أنثى)
الفئة العمرية	ضع دائرة حول واحدة مما يلي : أقل من (15) ، (18- 25) ، (26-45) ، (46- 65)
1	تنفيذ المشروع سوف يساهم في ضمان استمرارية التعليم بشكل افضل . ✓
2	تنفيذ المشروع سوف يساهم في ارتفاع المستوى التعليمي وبالتالي التحصيل الدراسي للطلاب. ✓
3	تنفيذ المشروع سوف يوفر بيئة مدرسية عصرية تواكب التكنولوجيا (بتفعيل دور الحاسوب) . ✓
4	تنفيذ المشروع سوف يوفر طاقة آمنة بيئيا وصحيا . ✓
5	تنفيذ المشروع سيمثل عامل جذب لاستقطاب الطلاب وتشجيعهم على التعليم . ✓
6	تنفيذ المشروع سوف يوفر الكلفة التي كانت تنفق على الديزل . ✓
7	تنفيذ المشروع سوف يساهم في تحقيق الراحة النفسية للادارة المدرسية والطلاب على حد سواء . ✓
الأثار السلبية	
1	تنفيذ المشروع قد يكلف الادارة المدرسية عمال صيانة ✗
2	تنفيذ المشروع قد يشكل نفقة خلاف مع المدارس الاخرى التي لاتملك طاقة شمسية. ✗
3	تنفيذ المشروع قد يحتم على المدرسة اعطاء افضل النتائج مما يستلزم الادارة على مضاعفة جهودها . ✓
4	تنفيذ المشروع قد يؤدي الى خلافات نتاجة استغلال بعض الاهالي القريبين من المدرسة للطاقة الشمسية . ✗
5	قصر عمر البطارية و ضرورة التخلص منها نتيجة انتهاء صلاحيتها قد يؤدي الى تلوث البيئة (التخلص، بطريقة غير صحيحة). ✓
6	احتمال تلف الالواح بالراجع من الرصاص او لأي سبب اخر . ✗
7	تنفيذ المشروع قد يؤدي الى حوادث نتيجة عدم اتخاذ اجراءات السلامة اللازمة . ✗



استبيان حول تزويد المدارس بالطاقة الشمسية

الغرض

مرحبا ، اسمي [سمر محمد] وقد تم اختيار هذا المرفق لتزويده بالطاقة الشمسية . ينبغي أن تعالج الطاقة الشمسية احتياجات كهرباء المرفق وتحسين تقديم الخدمات. كجزء من هذه العملية ، نود أن نطرح عليك بعض الأسئلة :

تاريخ المقابلة:	٢٠٢٢/٨/٢٤م
اسم الباحثة/الباحث	سمر محمد خالد ناجي
اسم المنشأة:	مدرسة حولية الزور
اسم الشخص الذي تتم مقابلته	خالد عبد الله سالم
نوع المستفيد	ذكر (أنثى)
الفئة العمرية	ضع دائرة حول واحدة مما يلي : أقل من (15) ، (18- 25) ، (26-45) ، (46- 65)
1	تنفيذ المشروع سوف يساهم في ضمان استمرارية التعليم بشكل افضل . ✓
2	تنفيذ المشروع سوف يساهم في ارتفاع المستوى التعليمي وبالتالي التحصيل الدراسي للطلاب. ✓
3	تنفيذ المشروع سوف يوفر بيئة مدرسية عصرية تواكب التكنولوجيا (بتفعيل دور الحاسوب) . ✓
4	تنفيذ المشروع سوف يوفر طاقة آمنة بيئيا وصحيا . ✓
5	تنفيذ المشروع سيمثل عامل جذب لاستقطاب الطلاب وتشجيعهم على التعليم . ✓
6	تنفيذ المشروع سوف يوفر الكلفة التي كانت تنفق على الديزل . ✓
7	تنفيذ المشروع سوف يساهم في تحقيق الراحة النفسية للادارة المدرسية والطلاب على حد سواء . ✓
الأثار السلبية	
1	تنفيذ المشروع قد يكلف الادارة المدرسية عمال صيانة ✓
2	تنفيذ المشروع قد يشكل نفقة خلاف مع المدارس الاخرى التي لاتملك طاقة شمسية. ✗
3	تنفيذ المشروع قد يحتم على المدرسة اعطاء افضل النتائج مما يستلزم الادارة على مضاعفة جهودها . ✓
4	تنفيذ المشروع قد يؤدي الى خلافات نتاجة استغلال بعض الاهالي القريبين من المدرسة للطاقة الشمسية . ✗
5	قصر عمر البطارية و ضرورة التخلص منها نتيجة انتهاء صلاحيتها قد يؤدي الى تلوث البيئة (التخلص، بطريقة غير صحيحة). ✓
6	احتمال تلف الالواح بالراجع من الرصاص او لأي سبب اخر . ✗
7	تنفيذ المشروع قد يؤدي الى حوادث نتيجة عدم اتخاذ اجراءات السلامة اللازمة . ✓

Annex 7 Site Specific Data and Facilities Details

To reduce the ESMP file size and number of pages, the facilities details, layout and photos can be accessed via the below link:

YEEAP ESMP - Supply and Installation of Solar Power Systems to to 89 Facilities - Annex 7